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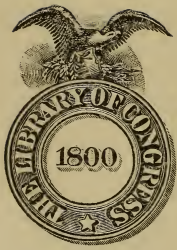
NEW CENSUS AND PATENT LAWS



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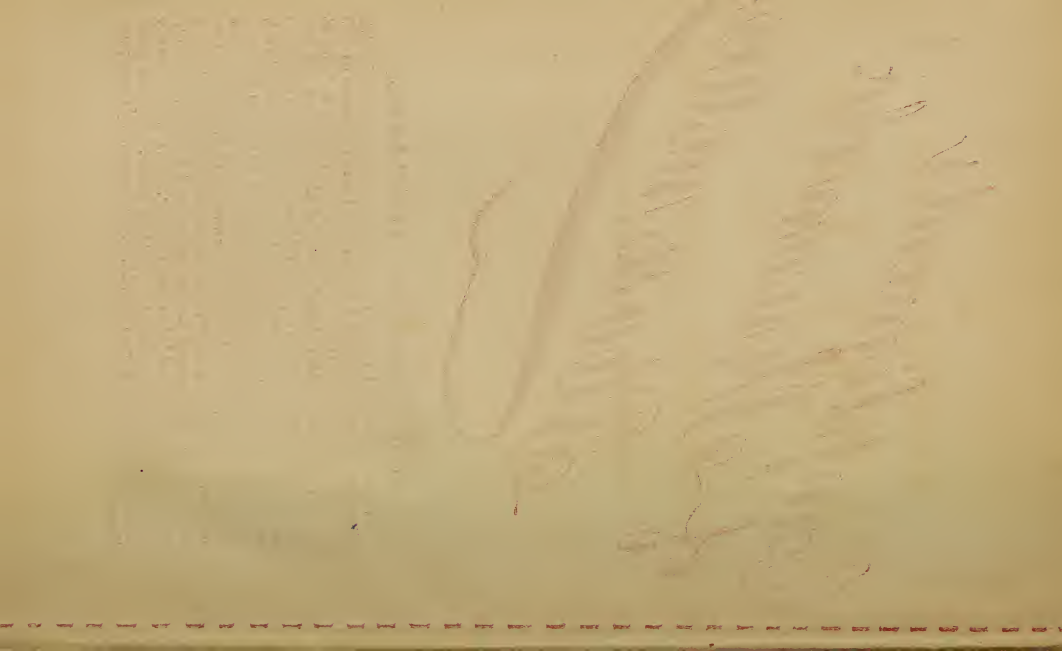
Compliments of Munn & Co.

Please notice.

NEW CENSUS AND PATENT LAWS.

We are indebted to Munn & Co., publishers of the *Scientific American*, New-York, for a neat little bound volume of 120 pages, entitled as above. It contains the complete Census of 1870, showing the Population, by Counties, of all the States and Territories, with their Areas, and the Population of the Principal Cities. Also, the new Patent Laws in full, with Forms, Official Rules, Directions how to obtain Patents, Copyrights, Regulations for Trade-Marks, Assignments, How to Sell Patents, etc. Also, a large variety of valuable information relating to Water-Wheels, Steam-Engines, and other mechanism, with many useful tables and recipes, 175 diagrams of Mechanical Movements, etc. We advise every body to send for it as above. Price, 25 cents. A more valuable compendium, for so small a price, has rarely been published.



THE

UNITED STATES

PATENT LAW.

INSTRUCTIONS

How to Obtain Letters Patent

FOR NEW INVENTIONS:

INCLUDING A VARIETY OF USEFUL INFORMATION CONCERNING THE RULES AND PRACTICE OF THE PATENT-OFFICE; HOW TO SELL PATENTS; HOW TO SECURE FOREIGN PATENTS; FORMS FOR ASSIGNMENTS AND LICENSES; TOGETHER WITH ENGRAVINGS AND DESCRIPTIONS OF THE CONDENSING STEAM-ENGINE, AND THE PRINCIPAL MECHANICAL MOVEMENTS, VALUABLE TABLES, CALCULATIONS, PROBLEMS, ETC., ETC.

BY

MUNN & CO., SOLICITORS OF PATENTS,
No. 37 Park Row, New-York.

New-York:
PUBLISHED BY MUNN & CO., AT THE OFFICE OF THE SCIENTIFIC AMERICAN,
No. 37 PARK ROW.

1871.

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MUNN & CO.,
in the Clerk's Office of the District Court of the United States for the
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From
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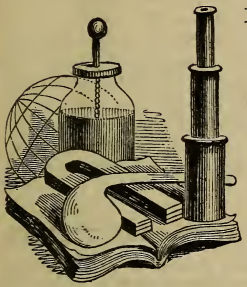
May 28, 1913.

S. W. GREEN,
PRINTER AND STEREOTYPER,
16 and 18 Jacob Street, New-York.

HOW TO INVENT.



IF we were asked to point out the course of life, business, or enterprise upon which any man of ordinary gifts might enter, with the best prospects of speedy success, we should unhesitatingly direct him to *invention*. Many and wonderful have been the achievements of modern genius. But the realm of invention is absolutely exhaustless, and only its outer edges have been explored. The world has yet to witness the most astounding triumphs of mind over matter.

It is a popular error to suppose that much knowledge, painful effort, constant disappointment, and many wearisome failures are the necessary preliminaries to an inventor's success. True, there are individual examples of this kind; they are exceptions.

It may be affirmed as the general rule, that inventors make money more quickly, more easily, and with less expenditure of thought, capital, or labor, than any other class of men.

It may also be affirmed that industrial enterprises and speculations which are connected with the development and introduction of new inventions are among the most sure and *profitable* investments that can be made.

The readiest way to invent is to *keep thinking*. In order to supply the mind with a constant succession of subjects, the inventor should cultivate habits of *observation*. Keep your eyes and ears open. Examine things about you, and seek to know how they are made, and how improved.

The young inventor should acquire a knowledge of the general laws and principles of natural philosophy, chemistry, and all of the sciences.

Leisure hours might be occupied with drawing and with books suggestive of improvements. To avoid waste of time in reproducing old devices, the inventor should be well posted in regard to inventions that have already been patented. For this purpose, an attentive study of *The Scientific American* will be almost indispensable.

The Boston *Journal* makes the following useful remarks: "Of course, in order to succeed, a new invention must be superior to any thing that has preceded it, and must be sold at a price that will enable it to be brought into general use.

People cannot afford to throw away old implements unless the new ones are enough better to make up for the loss. Let inventors produce a good article, at a moderate price, and they will be sure of success."

SMALL INVENTIONS MOST PROFITABLE.

In an official report of a Chief Examiner of the United States Patent Office, we find the following: "A patent, if it is worth any thing, when properly managed, is worth and can easily be sold for from ten to fifty thousand dollars. These remarks only apply to patents of minor or ordinary value. They do not include such as the telegraph, the planing-machine, and the rubber patents, which are worth millions each. A few cases of the first kind will better illustrate my meaning.

"A man obtained a patent for a slight improvement in straw-cutters, took a model of his invention through the Western States, and after a tour of eight months, returned with forty thousand dollars in cash, or its equivalent.

"Another inventor obtained extension of a patent for a machine to thresh and clean grain, and sold it, in about fifteen months, for sixty thousand dollars. A third obtained a patent for a printer's ink, and refused fifty thousand dollars, and finally sold it for about sixty thousand dollars.

"These are ordinary cases of minor invention, embracing no very considerable inventive powers, and of which hundreds go out from the Patent Office every year. Experience shows that the most profitable patents are those which contain very little real invention, and are to a superficial observer of little value."

HOW TO OBTAIN PATENTS.

THE first inquiry that presents itself to one who has made any improvement or discovery is: "Can I obtain a Patent?" A *positive* answer can only be had by presenting a complete application for a Patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After a season of great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning.

If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

We (MUNN & Co.) have been actively engaged in the business of obtaining patents for over twenty-five years. Many thousands of inventors have had benefit from our counsels. A large proportion of all patents granted are obtained by us.

Those who have made inventions and desire to consult with us in regard to obtaining patents are cordially invited to do so. We shall be happy to see them in person at our office, or to advise them by letter. In all cases, they may expect from us an *honest opinion*. For such consultations, opinion, and advice, *we make no charge*. A pen-and-ink sketch and a description of the invention should be sent, together with stamps for return postage. Write plain; do not use pencil nor pale ink; be brief.

All business committed to our care, and all consultations, are kept by us *secret and strictly confidential*. Address MUNN & Co., 37 Park Row, New-York.

SPECIAL EXAMINATIONS.

FEE $5.

IN many cases it will be advisable, as a measure of prudence, to order a PRELIMINARY EXAMINATION. This consists of a *special search*, made at the U. S. Patent Office, Washington, through the medium of our house in that city, to ascertain whether, among all the thousands of patents and models there stored, any invention can be found which will prevent the grant of a patent. On the completion of this special search, we send a *written report* of the result to the party concerned, with suitable advice. Our charge for this service is $5.

If the device has been patented, the time and expense of constructing models, preparing documents, etc., will, in most cases, be saved by means of this search; if the invention has been in part patented, the applicant will be enabled to modify his claims and expectations accordingly.

Many other obvious advantages attend Preliminary Examination, although the strictest search does not always enable the applicant to know absolutely, whether a patent will be granted.

For example, applications for patents are sometimes rejected because the Examining Officer finds a description of the alleged invention in some foreign publication; or some other person has been previously rejected on an analogous device; or some other invention, for a similar purpose, partially resembles the applicant's in its construction; or the Government makes an unjust or uncommon decision. Against none of these contingencies does the Preliminary Examination provide.

It will, however, generally inform the applicant whether an improvement similar to his, and used for the same purpose, *has ever been patented in this country.*

Parties desiring the Preliminary Examination are requested to remit the fee, ($5,) and furnish us with a sketch or photograph, and a brief explanation of the invention.

Where examination is wanted upon more than one invention, $5 for each must be sent; as each device requires a separate, careful search. Address MUNN & Co., 37 Park Row, N. Y.

OTHER INFORMATION.

IF you wish for *general information* as to the rules and law of Infringements, Reïssues, Claims, etc., state your inquiries clearly, and. remit $5. Opinions in special cases of Infringement cost more. See page 16.

If you wish for advice in regard to assignments, or upon the rights of parties under assignments, joint ownership in patents, contracts, or licenses, state the points clearly upon which information is wanted, and remit $5.

If you desire to know in whose name the title to a Patent is officially recorded, at Washington; or if you wish for an abstract of all the deeds of transfer connected with a Patent, send us the name of the patentee, date of patent, etc., and remit $5.

If you desire a sketch from the drawings of any Patent, and a description from the specification, give the patentee's name, date of the patent, and remit $5.

If you desire to have an assignment of a Patent, or any share thereof, or a license, made out in the proper manner, and placed on record, give us the full names of the parties, residences, title of the invention, etc., and remit $5. This includes record fee.

Inventions or shares thereof may be assigned either before or after the grant of a patent. Agreements and contracts in regard to inventions need to be recorded, like assignments, at Washington. For any agreement or contract that you wish prepared, remit $5.

☞ Remember that we (MUNN & Co.) have branch-offices in Washington, and have constant access to all the public records. We can therefore make for you *any kind of search*, or look up for you *any sort of information* in regard to Patents, or Inventions, or Applications for Patents, either pending or rejected, that you may desire.

CAVEATS.

The filing of a Caveat is oftentimes of great importance, as it may be quickly done, and affords a limited but *immediate protection.* The filing of a Caveat prevents, during its existence, the issue of a patent, without the knowledge of the Caveator, to any other person for a similar device. The Caveator is entitled to receive official notice, during a period of one year, of any other petition for a patent for a similar or interfering invention, filed during that time. On receiving such official notice, the Caveator is required to complete his own application within three months from the date of the notice.

A Caveat consists of a Specification, Drawing, Oath, and Petition. To be of any value, these papers should be carefully drawn up, and the official rules scrupulously complied with. No model is required. Our facilities enable us to prepare Caveat-papers with great dispatch.

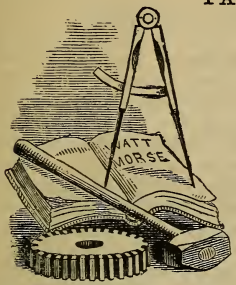
When specially desired, we can have them ready to send to the applicant, for signature and affidavit, by return mail, or at an hour's notice. The official fee for a Caveat is $10, and we generally charge $10 or $15 to prepare the accompanying papers and attend to the business—making $20 or $25 in all.

A Caveat runs for a year, and can be extended by paying $10 a year.

Caveats can only be filed by citizens of the United States, and aliens who have resided here one year and have declared their intention to become citizens.

To enable us to prepare Caveat papers, all that we need is a sketch, drawing, or photograph, and description of the invention, with which remit fees as above. Model not required.

PATENTS.



Under the present American law, all persons pay the same official fees, *without distinction as to nationality.* Patents are also granted to women and minors; also the executors or administrators of deceased inventors.

The first government fee on filing an application for a patent is $15; stamps, $1. Add to this the attorney's charge for drawings, specification, and attendance to the business of the case before the Patent-Office. Our charge for these services is, for simple cases, $25; and from that price upward to $35 or more, according to the time and labor required. If the patent is "allowed," a second government fee of $20 is then to be paid.

RECAPITULATION OF COSTS.

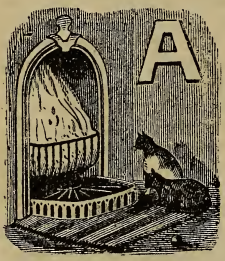
First Government fee and stamps, - - - -	$16
Munn & Co., Specifications, Drawings, and Business,	25
*Cost of making the application, - - -	$41
Second Government fee, payable if allowed, - -	20
†Whole cost of Patent, (if a simple case,) -	$61

In order to apply for a patent, all that is necessary is to send a model of the invention to Munn & Co., by express, with an explanation of the merits and working of the invention. Never mind spelling or grammar, but be very particular to give your ideas in full about the invention. Send us also the first government fee of $16. We will then prepare the drawings and specification, and send the latter to you for signature and oath.

Do not put the money in the box with the model, for it is liable to be stolen. Remit by express, postal order, check, or draft. See page 11.

* If a patent is not granted, the applicant loses the cost of making the application.
† When an appeal is required, there are additional expenses. See next page.

AMENDMENTS AND APPEALS.



We, Munn & Co., have an extensive Branch House in Washington, employing a corps of skilled assistants, and we make it our special duty to watch over the cases of our clients while they are before the Patent-Office. If the examining officer objects to the grant of the claims, or gives references, or requires amendments, we examine the references, and make the amendments, if we deem them proper, so as to secure the allowance of our client's patent as soon as possible. When the examiner refuses to allow a patent, and rejects the case, we report the fact to our client, and inform him as to the probabilities of obtaining a reversal of the examiner's decision by an appeal to the Examiners-in Chief.

First Appeal.—The government fee payable by the applicant on making an appeal to the Examiners-in-Chief, is $10. Our charges for preparing and conducting this appeal are very moderate, and in part contingent upon success.

Second Appeal.—From the decision of the Examiners-in-Chief an appeal may be taken to the Commissioner of Patents. Government fee, $20.

Third Appeal.—From the decision of the Commissioner of Patents an appeal may be taken to the Supreme Court of the District of Columbia. The applicant pays all the costs.

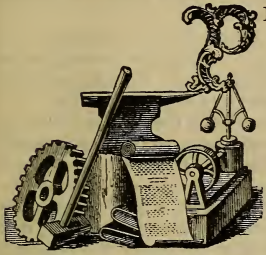
REJECTED CASES.

We shall be happy to take up REJECTED CASES, or to remodel defective papers for parties who have made application for themselves or through other agents. Terms moderate. Address Munn & Co., stating the particulars.

LAPSED CASES.

WHERE a patent has been allowed but forfeited by neglect to pay the second government fee, the case may be renewed within two years, by filing a new application. See page 60.

MODELS, REMITTANCES, ETC.



PERSONS who apply for patents are by law required to furnish a model, in all cases where the invention can be illustrated or partly illustrated by a model. The model must not exceed twelve inches in any of its dimensions; it should be neatly made, of hard wood or metal, or other substantial material; the name of the inventor should be engraved or painted upon it conspicuously. Where the invention consists of an improvement on some known machine, or part of a machine, a full working model of the whole will not be necessary. It should be sufficiently perfect, however, to show, with clearness, the nature and operation of the invention. More than one patent cannot be taken out on one model.

When the invention consists of a new article of manufacture or a new composition, samples of the article must be furnished.

New medicines or medical compounds, and useful mixtures of all kinds, are patentable. Samples must be furnished, and a very minute statement must be made of the exact proportions and ingredients used.

As soon as the model or specimen is ready, it should be carefully boxed and shipped, by express or otherwise, to our address, namely, MUNN & Co., No. 37 Park Row, New-York City. Prepay the expense, and send the express receipt to us by mail.

Simultaneously with the model or specimens, the inventor should also send us the first instalment of the Government fee and stamps, $16. The money may be forwarded either by express, with the model, or by mail. The safest way to remit is by draft on New-York, payable to our order, or by Post-Office order. Always send a letter with the model, and also with the remittance, stating the name and

address of the sender. We sometimes receive envelopes containing money, but without any name or explanation; models are also frequently sent us from equally unknown sources.

A full written description should also be sent with the model, embodying *all the ideas of the inventor respecting the operation and merits of the improvement.* This statement is often of assistance to us in preparing the specification.

On the reception of the model and Government fee, the case is duly registered upon our books, and the application proceeded with as fast as possible. When the documents are ready, we send them to the inventor by mail, for his examination, signature and affidavit, with a letter of instruction, etc. *Our fee for preparing the case is then due*, and will be called for. Immediately on its return, the case will be presented to the Patent Office, and as soon as the patent is allowed, the applicant will be notified to remit the last instalment of the Government fee, namely, $20, and the patent will then be issued.

Inventors who do business with us will be notified of the state of their application in the Patent Office, when it is possible for us to do so. We do not require the personal attendance of the inventor, unless the invention is one of great complication; the business can be done as well by correspondence.

The average time required to procure a patent is six weeks. We frequently get them through in less time; but in other cases, owing to delay on the part of the officials, the period is sometimes extended to two or three months, and even more. We make a special point to forward our cases *as rapidly as possible.*

Be neither lavish nor niggardly; of the two, avoid the latter. A mean man is universally despised, but public favor is a stepping-stone to preferment; therefore, generous feelings should be cultivated.

Never, under any circumstances, assume a responsibility you can avoid consistently with your duty to yourself and others.

DESIGN PATENTS.

The laws for the grant of patents for new designs are of the most liberal and comprehensive character, and their benefits may be enjoyed by all persons, without distinction as to nationality.

Foreign designers and manufacturers who send goods to this country may secure patents here upon their new patterns, and thus prevent other makers from selling similar goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, who, by his own industry, genius, efforts, and expense, has invented or produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, or patented or described in any printed publication, upon payment of the duty required by law, and other due proceedings had the same as in cases of inventions or discoveries.

Patents for designs are granted for the term of three and one half years, or for the term of seven years, or for the term of fourteen years, as the said applicant may elect in his application.

The petition, oath, specification, assignments, and other proceedings in the case of applications for letters-patent for a design are the same as for other patents.

The applicant must furnish drawings of the design or photographs thereof, in which latter case the Patent-Office requires that the negative shall also be furnished.

Those who desire to obtain patents for Designs are re-

quested to communicate with Munn & Co., No. 37 Park Row, New-York. City residents by calling at our office can have all the business promptly attended to.

The expenses for design patents are as follows:

Patent for three and a half years, whole expense, $20.

Patent for seven years, whole expense, $25.

Patent for fourteen years, whole expense, $40.

The above includes government fees and agents' charges.*

The personal presence of the applicant is not necessary in order to obtain a design patent, as the business can be done by correspondence.

Those who reside at a distance should send us their names in full, middle name included, together with two photographs of the design not mounted, and the negative. Also remit the fees as above, by draft, check, or postal order. We will then prepare the petition, oath, and specification, and forward the same to the applicant for signature. On their return by him, the papers are filed at the Patent-Office, when an official examination is made, and if no conflicting design is found to exist, a patent is issued.

For further information address Munn & Co. as above.

HARNESS BLACKING.

MELT 1 pound bees-wax, stir in 4 ounces ivory-black, 2 ounces spirits turpentine, 2 ounces Prussian blue ground in oil, and ½ ounce copal varnish. Make into balls. With a brush apply it to harness, and polish with silk gently.

RIGHTS OF WOMEN AND MINORS.

UNDER the laws of the United States, women and minors may obtain patents and copy-rights; they may also file caveats and register trade-marks. The laws make no distinctions as to sex or age.

A GALLON of sea-water weighs 68.31 pounds, and contains 4 to 5⅓ ounces of salt.

*[The government fee is $10 for three and a half years, $15 for seven years, and $30 for fourteen years. Our (Munn & Co.) charges are $10. When it is inconvenient for applicants to furnish their own drawings or photographs, we can supply them at a reasonable cost.]

TRADE-MARKS.

Any person or firm domiciled in the United States, and any corporation created by the authority of the United States, or of any State or territory thereof, and any person, firm, or corporation resident of or located in any foreign country which, by treaty or convention, affords similar privileges to citizens of the United States, and who are entitled to the exclusive use of any lawful trade-mark, or who intend to adopt or use any trade-mark for exclusive use within the United States, may obtain protection for such lawful trade-mark by complying with the official requirements.

Those who desire to secure protection for trade-marks, labels, etc., are requested to communicate with Munn & Co., No. 37 Park Row, New-York.

City residents, by calling at our office, can have all the business quickly attended to. Those who live at a distance will please observe the following directions:

1. Send us the names of the parties, their residence, and place of business.

2. State the class of merchandise and the particular description of goods in connection with which the trade-mark is to be used.

3. Describe the particular mode in which the trade-mark has been and is intended to be applied and used. For example, for a trade-mark for sheetings, the statement would be, "The trade-mark is to be printed in blue ink, upon the outside of each piece of sheeting" Or, 'The trade-mark is to be printed in black, or red, white, and blue, upon the exterior of a paper wrapper, which is to cover or extend around each package of the goods."

4. State whether the trade-mark is already in use, and if so, how long it has been used.

5. Send us six copies of the trade-mark.

Also remit at the same time $35 in full for the expenses, of which $25 are for government fees, and $10 Munn & Co.'s charge.

We will then prepare the necessary petition, declaration, and oath for signature by the applicant, and shortly thereafter forward to him the official certificate of protection.

In applying for protection for a trade-mark, a declaration must be made under oath by the applicant or some member of the firm or officer of the corporation, to the effect that the party claiming protection for the trade-mark has a right to the use of the same, and that no other person, firm, or corporation has a right to such use, either in the identical form or having such near resemblance thereto as might be calculated to deceive, and that the description and fac-similes presented for record are true copies of the trade-mark sought to be protected.

Trade-marks remain in force for thirty years, and may be renewed for thirty years more, except in cases where such trade-mark is claimed for, and applied to, articles not manufactured in this country, and in which it receives protection under the laws of any foreign country for a shorter period, in which case it shall cease to have force in this country at the same time that it becomes of no effect elsewhere.

No proposed trade-mark will be received or recorded which is not and can not become a lawful trade-mark, or which is merely the name of a person, firm, or corporation only, unaccompanied by a mark sufficient to distinguish it from the same name when used by other persons, or which is identical with a trade-mark appropriate to the same class of merchandise and belonging to a different owner, and already registered or received for registration, or which so nearly resembles such last-mentioned trade-mark as to be likely to deceive the public; but any lawful trade-mark already lawfully in use may be recorded

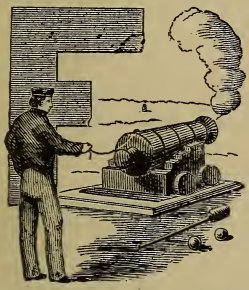
The right to the use of any trade-mark is assignable by any instrument of writing, and such assignment must be recorded in the Patent-Office within sixty days after its execution.

Trade-marks are registered at the Patent-Office in the exact order of their reception, the exact time of receipt being noted and recorded.

Certified copies of any trade-mark may always be obtained.

For further information concerning trade-marks address Munn & Co.

GENERAL REMARKS.



OR over *twenty years* Messrs. Munn & Co. have been personally familiar with the progress of invention and discovery. As an evidence of the confidence reposed in them, they may with propriety refer to the extraordinary fact that nearly TWENTY THOUSAND PATENTS have been obtained by them; and through their efficient Branch Office in Washington they have examined into the novelty of *many thousand inventions*, thus affording to them a knowledge of the contents of the Patent Office unrivalled by any existing agency.

Not only this, but a large majority of all the patents secured by American citizens in European countries are taken through MUNN & CO.'S AGENCIES IN LONDON, PARIS, BRUSSELS, BERLIN, AND VIENNA.

In addition to the advantages which the long experience and great success of our firm in obtaining patents present to inventors, they are informed that all inventions patented through our establishment are noticed, *at the proper time*, in The Scientific American. This paper is read by more than one hundred thousand persons every week, and has the most extensive and influential circulation of all the journals of its kind in the world.

No individual in the country can possibly have so good an opportunity of knowing and judging as to the extent of business and the qualification of patent attorneys as the *Commissioner of Patents*. Judge Mason, upon retiring from the office of the Commissioner of Patents, sent us the following very flattering written testimonial:

COMMISSIONER MASON'S LETTER.

MESSRS. MUNN & Co.:

I take pleasure in stating that, while I held the office of Commissioner of Patents, MORE THAN ONE FOURTH OF ALL THE BUSINESS OF THE OFFICE CAME THROUGH YOUR HANDS. I have no doubt that the public confidence thus indicated has been FULLY DESERVED, as I have always observed, in all your intercourse with the office, a MARKED DEGREE of *promptness*, *skill*, and *fidelity* to the interests of your employers.

Yours, very truly, CHAS. MASON.

Judge MASON was succeeded by that eminent patriot and statesman, Hon. JOSEPH HOLT, whose administration of the Patent Office was so distinguished that he was appointed Postmaster-General of the U. S. Hon. Mr. HOLT was subsequently appointed Judge-Advocate-General. He addressed us the following very gratifying communication:

COMMISSIONER HOLT'S LETTER.

MESSRS. MUNN & Co.:

It affords me much pleasure to bear testimony to the *able and efficient manner* in which you discharged your duties as Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was VERY LARGE, and you sustained (and I doubt not justly deserved) the reputation of *energy*, MARKED ABILITY, and *uncompromising fidelity* in performing your professional engagements.

Very respectfully, your obedient servant, J. HOLT.

Hon. WM. D. BISHOP, late Member of Congress from Connecticut, succeeded Mr. HOLT as Commissioner of Patents. Upon resigning the office, he wrote to us as follows:

COMMISSIONER BISHOP'S LETTER.

MESSRS. MUNN & Co.:

It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very

large proportion of the business of inventors before the Patent Office was transacted through your agency; and that I have ever found you faithful and devoted to the interests of your clients as well as EMINENTLY QUALIFIED to perform the duties of Patent Attorneys with skill and accuracy.

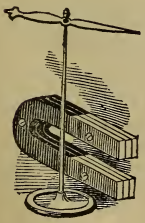
Very respectfully, your obedient servant,

WM. D. BISHOP.

One great reason for our unrivalled success is, that our affairs are so systematized and arranged under our personal direction, that every patent case submitted to our care receives the most careful study during its preparation, the most prompt dispatch, and the most thorough attention at every stage of its subsequent progress.

HOW TO CONVERT PAPER INTO GOLD.

SEND a subscription in paper money to Munn & Co., and enjoy a year's reading of THE SCIENTIFIC AMERICAN. Ten to one that the information thus obtained will result in bringing into your coffers, before the year is out, a hundred times more money in gold, than the original investment.



HE speed of an electric spark travelling over a copper wire, has been ascertained by Wheatstone to be two hundred and eighty-eight thousand miles in a second.

PARTIES sending models to the SCIENTIFIC AMERICAN office, on which they decide not to apply for Letters Patent, and which they wish preserved, will please to order them returned as early as possible. We cannot undertake to store such models, and if not called for within a reasonable time, we are obliged to destroy them, to make room for new arrivals.

GENERAL

INFORMATION CONCERNING PATENTS.

COMPILED CHIEFLY FROM THE
OFFICIAL RULES AND REGULATIONS FOR PROCEEDINGS IN THE PATENT-OFFICE, INCLUDING FORMS FOR ASSIGNMENTS, ETC.

Who may obtain a Patent.

ANY person, whether citizen or alien, being the original and first inventor or discoverer of any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent for his invention or discovery.

Joint inventors are entitled to a joint patent; neither can claim one separately; but independent inventors of separate improvements in the same machine can not obtain a joint patent for their separate inventions; nor does the fact that one man furnishes the capital and the other makes the invention entitle them to take out a joint patent.

In case of an assignment of the whole, or of any undivided interest in the invention, the patent may issue to the assignee of the whole interest, or jointly to the inventor and the assignee of the undivided interest, the assignment being first entered of record, and the application being duly made and the specification duly sworn to by the inventor.

The application must be made by the actual inventor, if alive, even if the patent is to issue or reissue to an assignee; but where the inventor is dead, the application and oath may be made by the executor or administrator.

Form of Petition for a Patent with power of Attorney.

To the Commissioner of Patents:

Your petitioner prays that letters-patent may be granted to him for the invention set forth in the annexed specification; and he hereby appoints Munn & Co., of the cities of New-York and Washington, D. C., his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent-Office connected herewith. Peter Pendent.

[Fifty-cent revenue stamp.]

Two or more distinct and separate inventions may not be claimed in one application; but where several inventions are necessarily connected each with the other, they may be so claimed.

The specification must be signed by the inventor, or if deceased, by his executor or administrator, and must be attested by two witnesses. Full names must be given, and all names, whether of applicant or witnesses, must be legibly written.

The Oath of Invention.

The oath of invention should follow the specification. The following is the official form:

State of New-York, County of Albany, ss.:

Peter Pendent, the above-named petitioner, being duly sworn, (or affirmed,) deposes and says that he verily believes himself to be the original and first inventor of the improvement in seed-drills described in the foregoing specification; that he does not know and does not believe that the same was ever before known or used; and that he is a citizen of the United States. Peter Pendent.

Sworn to and subscribed before me this 13th day of March, 1869. Simon Shallow,
Justice of the Peace.

If the applicant be an alien, the sentence, "and that he is

a citizen of the United States," will be omitted, and in lieu thereof will be substituted, "and that he is a citizen of the republic of Mexico," or, "and that he is a subject of the King of Italy," or, "of the Queen of Great Britain," or as the case may be.

If the applicants claim to be *joint inventors*, the oath will read, "that they verily believe themselves to be the original, first, and joint inventors," etc.

The oath or affirmation may be made before any person within the United States, authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, *chargé d'affaires*, consul, or commercial agent, holding commission under the government of the United States, or before any notary public of the foreign country in which the applicant may be, the oath being attested in all cases, in this and other countries, by the proper official seal of such notary.

The Drawings.

The applicant for a patent is required by law to furnish a drawing of his invention, where the nature of the case admits of it.

Such drawing must be on thick, smooth drawing-paper, sufficiently stiff to support itself in the portfolios of the office. It must be neatly and artistically executed, with such detached sectional views as to clearly show what the invention is in construction and operation. Each part must be distinguished by the same number or letter whenever it appears in the several drawings. The name of the invention should be written at the top, the shortest side being considered as such. This drawing must be signed by the applicant or his attorney, and attested by two witnesses, and must be sent with the specification.

The sheet must not be larger than ten inches by fifteen, that being the size of the patent. If more illustrations are needed, several sheets must be used.

The Model.

An applicant upon filing his specification and drawings

may submit to the Commissioner the question whether he shall deposit a model or specimen of his invention; otherwise, a model will be required in every case, except for designs, where the nature of the invention admits of such illustration. Such model must clearly exhibit every feature of the machine which forms the subject of a claim of invention.

The model must be neatly and substantially made, of durable material. It should be made as small as possible, but not in any case more than one foot in length, width, or height. If made of pine or other soft wood, it should be painted, stained, or varnished. Glue must not be used, but the parts should be so connected as to resist the action of heat or moisture.

A working model is always desirable, in order to enable the office fully and readily to understand the precise operation of the machine. The name of the inventor, and of the assignee, (if assigned,) and also the title of the invention, must be affixed upon it in a permanent manner.

Compositions of Matter.

When the invention is a composition of matter, a specimen of each of the ingredients and of the composition must accompany the application, and the name of the inventor and of the assignee (if there be one) must be permanently affixed thereto.

The Official Examination.

No application can be examined, nor can the case be placed upon the files for examination, until the fee is paid, the specification, with the petition and oath, filed, and the drawings and model or specimen (when required) filed or deposited.

All cases in the Patent-Office are classified and taken up for examination in regular order; those in the same class being examined and disposed of, as far as practicable, in the order in which the respective applications are completed. When, however, the invention is deemed of peculiar importance to some branch of the public service, and when, for that reason, the head of some department of the govern-

ment specially requests immediate action, the case will be taken up out of its order. These, with applications for reissues, and for letters-patent for inventions for which a foreign patent has already been obtained, which cases have precedence over original applications, are the only exceptions to the rule above stated in relation to the order of examination.

The personal attendance of the applicant at the Patent-Office is unnecessary. The business can be done by correspondence or by attorney.

The Patent-Office will not return specifications for amendment; and in no case will any person be allowed to take any papers, drawings, models, or samples from the office. If applicants have not preserved copies of such papers as they wish to amend, the office will furnish them on the usual terms.

The final fee on issuing a patent must be paid within six months after the time at which the patent was allowed, and notice thereof sent to the applicant or his agent. And if the final fee for such patent be not paid within that time, the patent will be forfeited, and the invention therein described become public property, as against the applicant therefor, unless he shall make a new application therefor within two years from the date of the original allowance.

Date of Patent.

Every patent will bear date as of a day not later than six months from the time at which it was passed and allowed, and notice thereof was sent to the applicant or his agent, and if the final fee shall not be paid within that period, the patent will be withheld. *No patent will be antedated.*

Appeals.

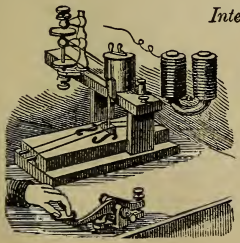
Every applicant for a patent or the reissue of a patent, any of the claims of which have been twice rejected, and every party to an interference, may appeal from the decision of the primary examiner, or of the examiner in charge of interferences, in such case, to the board of examiners-in-chief, having once paid a fee of ten dollars. For this pur-

pose a petition in writing must be filed, signed by the party or his authorized agent or attorney, praying an appeal and setting forth briefly and distinctly the reasons upon which the appeal is taken.

All cases which have been acted on by the board of examiners-in-chief may be brought before the Commissioner in person, upon a written request to that effect, and upon the payment of the fee of twenty dollars required by law. A case deliberately decided by one Commissioner will not be disturbed by his successor. The only remaining remedy will be by appeal, in those cases allowed by law, to the Supreme Court of the District of Columbia, sitting in banc.

The mode of appeal from the decision of the office to the Supreme Court of the District of Columbia is by giving written notice thereof to the Commissioner; said notice being accompanied by the petition addressed to the Supreme Court of the District of Columbia, by the reasons of appeal and by a certified copy of all the original papers and evidence in the case. The reasons of appeal must be filed within thirty days after notice of the decision appealed from.

[NOTE.—Messrs. MUNN & Co. have had twenty-five years' experience in conducting appeals in patent cases.]



Interferences.

An "interference" is an interlocutory proceeding for the purpose of determining which of two or more persons, each or either of whom claims to be the first inventor of a given device or combination, really made the invention first.

The fact that one of the parties has already obtained a patent will not prevent an interference; for, although the Commissioner has no power to cancel a patent already issued, he may, if he finds that another person was the prior inventor, give him also a patent,

and thus place them on an equal footing before the courts and the public.

Upon the declaration of an interference, each party will be required, before any time is set for the taking of testimony, to file a statement under oath giving the date and a detailed history of the invention; showing the successive experiments, steps of development, extent and character of use, and forms of embodiment. Such statement shall not be open to inspection by the other party, until both are filed, or until the time for filing both has expired. In default of such filing by either party, or if the statement of either fails to overcome the *prima-facie* case made by the respective dates of application, or if it shows that the invention has been abandoned or that it has been in public use for more than two years prior to the application of affiant, the other party shall be entitled to an adjudication by default upon the case as it stands upon the record.

In cases of interference, parties have the same remedies by appeal as other applicants, to the examiners-in-chief and to the Commissioner, but no appeal lies, in such cases, from the decision of the Commissioner. Appeals in interference cases should be accompanied with a brief statement of the reasons thereof.

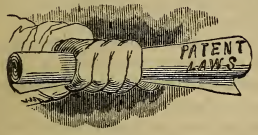
In cases of interference, the party who first filed so much of his application for a patent as illustrates his invention will be deemed the first inventor in the absence of all proof to the contrary. A time will be assigned in which the other party shall complete his direct testimony; and a further time in which the adverse party shall complete the testimony on his side; and a still further time in which both parties may take rebutting testimony, but shall take no other. If there are more than two parties, the times for taking testimony shall be so arranged, if practicable, that each shall have a like opportunity in his turn, each being held to go forward and prove his case against those who filed their applications before him.

If either party wishes the time for taking his testimony, or for the hearing, postponed, he must make application for such postponement, and must show sufficient reason for it by affidavit filed before the time previously appointed has

elapsed, if practicable; and must also furnish his opponent with copies of his affidavits, and with reasonable notice of the time of hearing his application.

[NOTE.—The management of interferences is one of the most important duties in connection with Patent-Office business. Our terms for attention to interferences are moderate, and dependent upon the time required. Address all letters to MUNN & Co., No. 37 Park Row, New-York.]

Reissues.



A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest, when by reason of a defective or insufficient specification the original patent is inoperative or invalid, provided the error nas arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention; but although the patent has been assigned, the application must be made, and the specification sworn to, by the inventor.

The petition for a reissue must show that all parties owning any undivided interest in the patent, concur in the surrender. A statement, under oath, of the title of the party proposing to surrender must be filed with the application.

The general rule is, that whatever is really embraced in the original invention, and so described or shown that it might have been embraced in the original patent, may be the subject of a reissue; but no new matter shall be introduced into the specification, nor in case of a machine patent shall the model or drawings be amended, except each by the other; but, when there is neither model nor drawing, amendments may be made upon proof satisfactory to the Commissioner, that such new matter or amendment was a part of the original invention, and was omitted from the specification by inadvertence, accident, or mistake, as aforesaid.

Reissued patents expire at the end of the term for which the original patent was granted. For this reason applications for reissue will be acted upon as soon as filed.

A patentee, in reissuing, may at his option have a separate patent for each distinct and separate part of the invention comprehended in his original patent, by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Each division of a reissue constitutes the subject of a separate specification descriptive of the part or parts of the invention claimed in such division; and the drawing may represent only such part or parts. All the divisions of a reissue will issue simultaneously. If there be controversy as to one, the other will be withheld from issue until the controversy is ended.

In all cases of applications for reissues, the original claim, if reproduced in the amended specification, is subject to re-examination, and may be revised and restricted in the same manner as in original applications; but if any reissue be refused, the original patent will, upon request, be returned to the applicant.

[NOTE.—The documents required for a reissue are a statement, petition, oath, specification, drawings. The official fee is $30. Our charge, in simple cases, is $30 for preparing and attending to the case. Total ordinary expense, $60.

By means of reissue, a patent may sometimes be divided into several separate patents. Many of the most valuable patents have been several times reissued and subdivided. Where a patent is infringed and the claims are doubtful or defective, it is common to apply for a reissue with new claims which shall specially meet the infringers.

On making application for reissue, the old or original patent must be surrendered to the Patent-Office, in order that a new patent may be issued in its place. If the original patent has been lost, a certified copy of the patent must be furnished, with affidavit as to the loss. To enable us to prepare a reissue, the applicant should send to us the original patent, remit as stated, and give a clear statement of the points which he wishes to have corrected. We can then immediately proceed with the case. Address MUNN & Co., 37 Park Row, New-York. We have had twenty-five years' experience in obtaining reissues.]

Disclaimers.

Whenever, by inadvertence, accident, or mistake, the claim of invention in any patent is too broad, embracing more than that of which the patentee was the original or first inventor, some material or substantial part of the thing patented being truly and justly his own, the patentee, his heirs or assigns, whether of the whole or of a sectional interest, may make disclaimer of such parts of the thing patented as the disclaimant shall not choose to claim or to hold by virtue of the patent or assignment, stating therein the extent of his interest in such patent; which disclaimer shall be in writing, attested by one or more witnesses, and recorded in the Patent-Office. The official fee on filing a disclaimer is ten dollars.

Extensions.

Power is vested in the Commissioner to extend any patent granted prior to March 2d, 1861, for seven years from the expiration of the original term; but no patent granted since March 2d, 1861, can be extended.

The applicant for an extension must file his petition and pay in the requisite fee not more than six months nor less than ninety days prior to the expiration of his patent. There is no power in the Commissioner to renew a patent after it has once expired.

The applicant for an extension must furnish to the office a statement in writing, under oath, of the ascertained value of the invention, and of his receipts and expenditures on account thereof, both in this and foreign countries. This statement must be made particular and in detail, unless sufficient reason is set forth why such a statement can not be furnished. It must be filed within thirty days after filing the petition.

[NOTE.—Only patents issued prior to March 4th, 1861, can be extended.

Many valuable patents are annually expiring which might readily be extended, and, if extended, might prove the source of wealth to their fortunate possessors.

All the documents connected with extensions require to be

carefully drawn up and attended to, as any failure, discrepancy, or untruth in the proceedings or papers is liable to defeat the application.

In case of the decease of the inventor, his administrator may apply for and receive the extension; but no extension can be applied for or granted to an assignee of an inventor. Parties desiring extensions will address MUNN & Co., 37 Park Row, New-York.]

Assignments.

A patent may be assigned, either as to the whole interest or any undivided part thereof, by any instrument of writing. No particular form of words is necessary to constitute a valid assignment, nor need the instrument be sealed, witnessed, or acknowledged.

A patent will, upon request, issue directly to the assignee or assignees of the entire interest in any invention, or to the inventor and the assignee jointly, when an undivided part only of the entire interest has been conveyed.

In every case where a patent issues or reissues to an assignee the assignment must be recorded in the Patent-Office at least five days before the issue of the patent, and the specification must be sworn to by the inventor.

Every assignment or grant of an exclusive territorial right must be recorded in the Patent-Office within three months from the execution thereof; otherwise it will be void as against any subsequent purchaser or mortgagee for a valuable consideration without notice; but, if recorded after that time, it will protect the assignee or grantee against any such subsequent purchaser, whose assignment or grant is not then on record.

The patentee may convey separate rights under his patent to make or to use or to sell his invention, or he may convey territorial or shop rights which are not exclusive. Such conveyances are mere licenses, and need not be recorded.

The receipt of assignments is not generally acknowledged by the office. They will be recorded in their turn within a few days after their reception, and then transmitted to the persons entitled to them. A five-cent revenue stamp

is required for each sheet or piece of paper on which an assignment, grant, or license may be written.

Forms of Assignments of the entire interest in an invention before the issue of letters-patent.

In consideration of one dollar to me paid by Ephraim G. Hall, of Cleveland, Ohio, I do hereby sell and assign to said Ephraim G. Hall all my right, title, and interest in and to a certain invention in plows, as fully set forth and described in the specification which I have prepared [if the application has been already made, say "and filed"] preparatory to obtaining letters-patent of the United States therefor. And I do hereby authorize and request the Commissioner of Patents to issue the said letters-patent to the said Ephraim G. Hall, as my assignee, for the sole use and behoof of the said Ephraim G. Hall and his legal representatives.

Witness my hand this 16th day of February, 1868.

J. F. CROSSETTE.

[Five-cent revenue stamp.]

Of the entire interest in letters-patent.

In consideration of five hundred dollars to me paid by Nathan Wilcox, of Keokuk, Iowa, I do hereby sell and assign to the said Nathan Wilcox all my right, title, and interest in and to the letters-patent of the United States, No. 41,806, for an improvement in locomotive head-lights, granted to me July 30th, 1864, the same to be held and enjoyed by the said Nathan Wilcox to the full end of the term for which said letters are granted, as fully and entirely as the same would have been held and enjoyed by me if this assignment and sale had not been made.

Witness my hand this 10th day of June, 1869.

HORACE KIMBALL.

[Five-cent revenue stamp.]

Of an undivided interest in the letters-patent and extension thereof.

In consideration of one thousand dollars to me paid by Obadiah N. Bush, of Chicago, Ill., I do hereby sell and

assign to the said Obadiah N. Bush one undivided fourth part of all my right, title, and interest in and to the letters-patent of the United States, No. 10,485, for an improvement in cooking-stoves, granted to me May 16th, 1856; the same to be held and enjoyed by the said Obadiah N. Bush to the full end of the term for which said letters-patent are granted, and for the term of any extension thereof, as fully and entirely as the same would have been held and enjoyed by me if this assignment and sale had not been made.

Witness my hand this 7th day of January, 1869.

JOHN C. MORRIS.

[Five-cent revenue stamp.]

Exclusive territorial grant by an assignee.

In consideration of one thousand dollars to me paid by William H. Dinsmore, of Concord, N. H., I do hereby grant and convey to the said William H. Dinsmore the exclusive right to make, use, and vend within the State of Wisconsin, and the counties of Cook and Lake in the State of Illinois, and in no other place or places, the improvement in corn-planters for which letters-patent of the United States, dated August 15th, 1867, were granted to Leverett R. Hull, and by said Hull assigned to me December 3d, 1867, by an assignment duly recorded in liber X^8, p. 416, of the records of the Patent-Office, the same to be held and enjoyed by the said William H. Dinsmore as fully and entirely as the same would have been held and enjoyed by me if this grant had not been made.

Witness my hand this 19th day of March, 1868.

ABRAHAM MOORE.

[Five-cent revenue stamp.]

License—shop right.

In consideration of fifty dollars to me paid by the firm of Simpson, Jenks & Co., of Huntsville, Ala., I do hereby license and empower the said Simpson, Jenks & Co. to manufacture, at a single foundry and machine shop in said Huntsville, and in no other place or places, the improvement in cotton-seed planters for which letters-patent of the United States, No. 71,846, were granted to me November

13th, 1868, and to sell the machines so manufactured throughout the United States, to the full end of the term for which said letters-patent are granted.

Witness my hand this 22d day of April, 1869.

JOEL NORCROSS.

[Five-cent revenue stamp.]

Table of Official Fees.

On filing every application for a design, for three years and six months	$10 00
On filing every application for a design, for seven years	15 00
On filing every application for a design, for fourteen years	30 00
On filing every caveat	10 00
On filing every application for a patent	15 00
On issuing each original patent	20 00
On filing a disclaimer	10 00
On filing every application for a reissue	30 00
On filing every application for a division of a reissue	30 00
On filing every application for an extension	50 00
On the grant of every extension	50 00
On filing the first appeal from a primary examiner to examiners-in-chief	10 00
On filing an appeal to the commissioner from examiners-in-chief	20 00
On depositing a trade-mark for registration	25 00
For every copy of a patent or other instrument, for every 100 words	10
For every certified copy of drawing, the cost of having it made	
For copies of papers not certified, the cost of having them made	
For recording every assignment of 300 words or under	1 00
For recording every assignment, if over 300 and not over 1000 words	2 00
For recording every assignment, if over 1000 words	3 00

COPY-RIGHTS.

Any citizen or resident of the United States may obtain a copy-right who is the author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph or negative thereof, or of a painting, drawing, chromo, statue, statuary, and of models and designs, intended to be perfected as works of the fine arts.

A copy-right can not be obtained unless the title or description is recorded in the library of Congress, *before the publication of the work.*

Those who desire to obtain copy-rights are requested to communicate with Munn & Co., No. 37 Park Row, New-York, and send us *the title* of the book, print, photograph, or article. We will then cause the title to be printed, and recorded at Washington, as by law required. The Official Certificate of copy-right will then be immediately sent to our client. Our charge to attend to the business of obtaining a copy-right is $5, which please remit with the title.

If a copy-right is desired for a painting, drawing, chromo, statue, statuary, or model or design for a work of art, send us a brief description thereof and $5.

Copy-rights are granted for the term of twenty-eight years, and may be renewed for fourteen additional years, if the renewal is filed within six months before the expiration of the first term.

Copy-rights may be assigned; the assignment must be recorded by the Librarian of Congress.

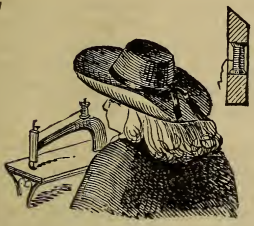
Infringers of copy-rights are subject to heavy fines and penalties.

Foreigners who are not residents of the United States can not obtain copy-rights; but if residents, they may obtain copyrights.

Address Munn & Co. for further information.

Common hydraulic cement mixed with oil forms a good paint for roofs and out-buildings. It is water-proof and incombustible.

MODELS.



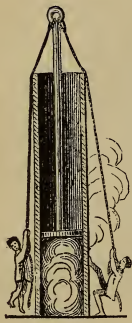
It is always better for inventors to have their models constructed under their own supervision, even at an increased cost in money or time. During the making of the model, the inventor often perceives points where important changes can be made, or where the invention may be rendered more perfect than was at first contemplated. But in some instances, owing to residence in distant parts or other causes, it is impossible for the inventor to furnish a model. In such cases, we (MUNN & Co.) can have proper models built by experienced and trusty makers, at moderate charges.

TRACING PAPER.

OPEN a quire of double crown tissue-paper, and brush the first sheet with a mixture of mastic varnish and oil of turpentine, equal parts; proceed with each sheet similarly, and dry them on lines by hanging them up singly. As the process goes on, the under sheets absorb a portion of the varnish, and require less than if single sheets were brushed separately. The inventor of this varnish for tracing-paper received a medal and premium from the Royal Society. It leaves the paper quite light and transparent, it may readily be written on, and drawings traced with a pen are permanently visible. Used by learners to draw out lines. The paper is placed on the drawing, which is clearly seen, and an outline is made, taking care to hold the tracing-paper steady. In this way, elaborate drawings are easily copied.

ALCOHOL has more than double the expansive force of water of the same temperature. The steam of alcohol at 174° is equal to that of water at 212°. When proper means can be invented for saving the fluid from being lost, it is supposed that alcohol can be employed with advantage as the moving power for engines.

VOICE OF THE PEOPLE.



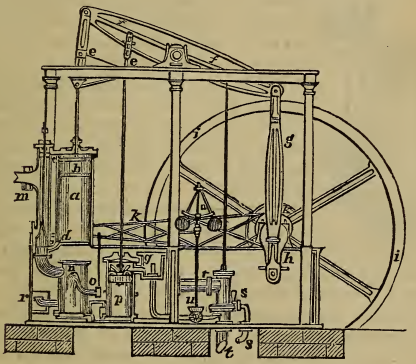
We might fill several volumes with flattering testimonials from all parts of the world, certifying to the great value of The Scientific American, but the limits of this little book only permit us to make a few selections. Read the following:

Messrs. Editors: Since I had the pleasure of receiving the back numbers of your interesting and instructive journal, I have shown specimens to several influential manufacturers and intelligent mechanics in this vicinity. One man told me that he had *twice* obtained five dollars for *a single recipe* that he copied out of The Scientific American, which he has taken regularly for several years; and I presume this is not an isolated case, by many hundreds. It is just such journals as yours that are annually condensed into encyclopedias, the compilers of which roughly scoop off the cream of all the new discoveries in science and art that have been recorded in the columns of various periodicals during the year; but the facts set forth in such annual works are often so mutilated or distorted in the condensation, and so meagre in outline, as to be practically of no value. Every mechanic and farmer in the land should subscribe for The Scientific American, not only for his own benefit, but also that of his children; he may have a Franklin or a Fulton, a West or a Watt, in that little marble-player whom he pets in his leisure hours; and the natural bias of the child's mind toward mechanical or agricultural pursuits requires to be confirmed or further developed by intellectual nourishment of such a quality and quantity as can be derived only from a journal like your own.

Never make money at the expense of your reputation.
Say but little—think much and do more.
Avoid borrowing and lending.

THE STEAM-ENGINE.

Every mechanic and inventor should make himself generally familiar with the construction and operation of the steam-engine. To assist them in gaining this knowledge, we subjoin for reference a diagram of the common Condensing Engine, with letters of reference to the names of the various parts:



a, steam cylinder; *b*, piston; *c*, upper steam port or passage; *d*, lower steam port; *e e*, parallel motion; *f f*, beam; *g*, connecting rod; *h*, crank; *i i*, fly-wheel; *k k*, eccentric and its rod for working the steam-valve; *l*, steam-valve and casing; *m*, throttle-valve; *n*, condenser; *o*, injection-cock; *p*, air-pump; *q*, hot well; *r*, shifting-valve to create vacuum in condenser previous to starting the engine; *s*, feed-pump to supply boilers; *t*, cold-water pump to supply condenser; *u*, governor. A study of the above diagram and description, in connection with attentive observation of engines in motion, will be of much assistance in acquiring a general understanding of the machine. We recommend the follow-

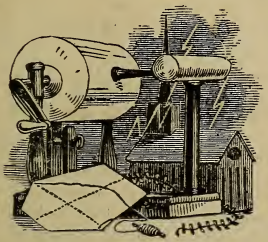
ing standard works for careful study by all who desire to become thoroughly posted: Bourne's Catechism of the Steam-Engine, Main & Brown's Marine Steam-Engine.

[From The Scientific American.]

A HINT TO LETTER-WRITING BORES.

WE consider, as a general thing, that our correspondents are a fair and high-minded set of men, such as we are most happy to accommodate by answering, so far as it is in our power, all their inquiries; but there are a few of whom we can very justly complain. They put to us all sorts of questions, to answer which might require a half-day of our valuable time; and if we snub them off with a short answer, they are likely to reply back in complaining terms. It cannot be reasonably expected of us, that we shall spend our time in such—to us—profitless letter-writing. We mean to be accommodating, but cannot consent to waste all our time in getting information for correspondents who seem not to know how to appreciate either our forbearance or the value of our time. As an example of what we mean, we have a case before us. A correspondent wants us to hunt through our files for a notice of some book which appeared in THE SCIENTIFIC AMERICAN some years ago, and to help him to find the book. He also wants us to find for him an English book which we do not believe can be had in this market. Another correspondent wants us to send to England without delay to get something which would require time and money to procure for him, but in regard to which he don't even inclose a three-cent stamp to pre-pay our letter. Another incloses three cents, and wants a calculation made which would cost us two hours' hard study. It is well enough for such correspondents to know that our time is worth to us more than a cent and a half per hour. Treat us fairly, and you will have no cause of complaint.

VOICE OF THE PRESS.



In examining the pages of our journal, we find them so covered with brilliant gems of commendation that it is difficult to select one which is more sparkling than another. We therefore take the following at random:

"The distinction achieved by the world-renowned firm of Munn & Co., as Solicitors of Patents, is alike *deserved* and commanding—deserved, because they have spared no effort nor expense since they entered upon their responsible vocation—commanding, because it is a distinction supported and upheld by all the scientific appliances within the reach of modern enterprise, and carries along with it a *prestige* which we in vain look for in the history of any similar firm. To the scores of inventors who are to be met with in this State—and especially to those among them whose diffidence may have hitherto restrained them from giving their discoveries to the world—we would say, by all means consult the firm of Messrs. Munn & Co., 37 Park Row, New-York, confident, as we feel, that by so doing (should your inventions possess merit) you will not only put yourself in the way of securing a patent for the same, but at the same time reap the satisfaction of knowing that you have committed your claims to hands emphatically qualified successfully to carry them out. We have deemed it a *duty*, in this mode, to 'say our say' in regard to an Agency which, while, we trust, it has been able to make its highly important business *pay*, has, at the same time, nobly upheld the true principles of scientific investigation, scorning to make the latter in the least degree subservient to merely pecuniary considerations."—*Rahway (N. J.) Times and Register.*

A CUBIC foot of air weighs 523 grains—a little more than an ounce. A cubic foot of water weighs 1000 ounces.

FOREIGN PATENTS.

American Inventors should bear in mind that, as a general rule, any invention which is valuable to the patentee in this country, is worth equally as much in England and some other foreign countries. Four patents—American, English, French, and Belgian—will secure an inventor exclusive monopoly to his discovery among *one hundred millions* of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home.

Models are not required in any European country, but the utmost care and experience is necessary in the preparation of the specifications and drawings. A variety of small tax duties and other fees must be paid; many official formalities are also to be observed in obtaining foreign patents. It is therefore important that the applicant should place his business in the hands of established and reliable agents.

For the past twenty years, the majority of all patents taken out by Americans in foreign countries have been obtained through Munn & Co.'s Scientific American Patent Agency, and nearly all of this foreign patent business is still done by us. Our experience and success in this branch is very great.

The following summary will give a general idea of the granting and duration of European Patents:

Great Britain.—Patents are granted for fourteen years to any person who is the inventor or the first importer. If a patent has been previously obtained in any other country, the British patent expires with it. The British patent extends over Great Britain and Ireland, but does not include

the Colonies. Separate patents are issued by the Colonies.

France.—Patents are granted for 15 years, unless the invention has been previously patented in some other country; in such case it dates and expires with the previous patent. The invention must be put into practice in France within 2 years from the date of the patent.

Belgium.—Patents are granted for 20 years, or, if previously patented in another country, they expire with the date thereof. The working of the invention must take place within one year from the date of patent, but an extension for an additional year may be obtained on application to the proper authorities.

Spain and Cuba.—The duration of a Spanish patent of importation is 5 years, and it can be prolonged to 10 years; the invention is to be worked within one year.

The patent may also include Cuba upon payment of an additional fee. The Governor-General of Cuba is also allowed to grant separate patents for that Island.

Austria.—Patents are granted for 15 years, and the fees are payable by instalments.

Russia.—Patents are granted for various terms, with fees proportionate to the term selected by the applicant.

Prussia.—The patent laws are less encouraging for inventors than those of any other European nation. The invention must be worked within 6 months, and the application may be rejected if the Royal Commission think proper.

FULL INSTRUCTIONS

For taking out Foreign Patents in all the principal countries of the world, with the costs, are contained in a SPECIAL PAMPHLET, which we publish and send FREE OF CHARGE. Address MUNN & Co., 37 Park Row, New-York.

CAUTION.—Pay no attention to the solicitations of foreign agents of unknown responsibility, who send circulars to parties whose names they copy from the patent lists of THE SCIENTIFIC AMERICAN.

CLEAR, dry, cold air contains more oxygen, is more bracing to the human system, and is heavier than moist air. People are accustomed to say that the air on damp days feels heavy; but the truth is the air is lighter, and therefore the blood is less oxydized, and the feelings consequently depressed.

HOW TO SELL PATENTS.

In the prefatory portion of this little work, we have presented hints upon the general success of inventors, and the great value of even the simplest inventions. But it must not be supposed, because a patent is granted, that the world will run after an unknown man to buy from him an unknown patent. In order to sell a patent, judicious effort is required on the part of the inventor or his agent. Indeed, his final success will depend, to a considerable extent, upon his business tact and energy. He should make himself thoroughly conversant with the merits of his invention, and should prepare specimens or model machines thereof, made in the most perfect manner, so as readily to exhibit the operations of the improvement to others.

After obtaining a patent, the first grand requisite in effecting its sale is to make the merits and importance of the improvement *publicly known*. This may be done in various ways: by advertisements in newspapers, by cards, circulars, pamphlets, etc., by local and travelling agents. Some persons appoint agents in each town or county, giving them a liberal portion of the net proceeds for the sale of rights, or a handsome per cent upon the receipts for machines sold. In estimating the value of patent rights for different States, counties, etc., one very common method is to fix the price with reference to the amount of population.

One of the most comprehensive and powerful methods of bringing the merits of an invention before the public, is to have it noticed and engraved in The Scientific American. This paper, published weekly, has a large circulation. It is seen by probably not less than one or two hundred thousand readers, who comprise all of the most intelligent persons of scientific and mechanical acquirements in the country. The fact of publication in The Scientific Amer-

ICAN is a passport to their attention and favor. It is upon the judgment and advice of scientific and mechanical persons that the purchasers of patent rights and new inventions are apt to rely. "Yes, that is a good invention. It has been well illustrated in THE SCIENTIFIC AMERICAN, and I fully understand its construction. I advise you to purchase the right." We suppose that more patents are sold upon such advice than by all other agencies and means put together.

To assist the sale, it is always advisable to have the patent taken out through the SCIENTIFIC AMERICAN AGENCY. The study necessary to the preparation of the specification and drawings familiarizes our minds with the merits of the invention, and as all worthy inventions patented by us are noticed in THE SCIENTIFIC AMERICAN, we are enabled to speak of them with some degree of authority.

We keep artists constantly employed in preparing engravings for THE SCIENTIFIC AMERICAN. All our engravings are original. We never print old cuts. Parties who desire to have engravings inserted in THE SCIENTIFIC AMERICAN will please address MUNN & Co., 37 Park Row, New-York. After publication, the engravings will be returned to the owner, who can then use them for other papers, circulars, etc.

AGENTS TO SELL.

WE are often asked to give the names of parties who make it a business to sell patents. We are rarely enabled to do so. Such concerns are generally quite fugitive in their character. An office is opened, signs displayed, a few customers engaged, and then suddenly the shop is closed. The truth is, that the profit upon the sales of a single good patent is equivalent to a fortune, and the business it furnishes is enough to fully engage the attention of many persons. Our advice to patentees is: Take hold of the business of selling yourselves. If you want assistance, search for agents among your friends, and interest them specially in your invention.

ROYALTY.

One very profitable source of income from patents is *royalty*. This, in effect, involves a sort of contract between a patentee and a manufacturer, by which the latter, in consideration of license to make the thing, agrees to pay to the patentee a specified sum upon each article when sold. The patentee of the chimney-spring, now so commonly used to fasten chimneys upon lamps, was accustomed to grant licenses to manufacturers on receiving a royalty of a few cents per dozen. His income was at one time reported to be fifty thousand dollars a year from this source. Howe, the inventor of the sewing-machine, is said to receive a royalty of from five to ten dollars on each machine, and his annual income has been estimated at five hundred thousand dollars. We might give many examples of success. The license and royalty plan is oftentimes the most profitable method of employing patents.

A Circle is the most capacious of all plain figures, or contains the greatest area within the same outline or perimeter.

To find the circumference of a circle, multiply the diameter by 3.1416, and the product will be the circumference.

To find the diameter of a circle, divide the circumference by 3.1416, and the quotient will be the diameter.

Any circle whose diameter is double that of another, contains four times the area of the other.

Some employers think themselves entitled to the ownership of all inventions made by their workmen. But this is not so. Employers have no claim to the inventions of their workmen unless it can be shown that the latter was specially employed to bring out such inventions.

[From The Scientific American.]

PATENTS ON SMALL THINGS.

An English firm has lately patented a peculiar shape for candle-ends. By making them conical, or tapering, they will fit any candlestick without being papered or tinkered up in other ways. Now, a very small royalty on each pound of candles will give a large annual revenue to the inventors, and the pecuniary value of their idea is seen at once. Similar instances might be given from cases at home, where inventors have originated some simple article in daily use and secured it, they have received large rewards. "Despise not the day of small things," says the proverb, and we may say, in addition, deride no idea as useless that tends to advance the arts and sciences, merely because it seems simple.

A very great misconception prevails in the minds of many persons in respect to patents. They are regarded chiefly as stepping-stones to fame or passports to future notoriety. This is a huge delusion. An invention is first and principally an investment, just as an artist's picture, although an inspiration, is a commercial venture. The glory and renown attaching to either picture or invention is the afterpart, the dessert to the solid feast on dollars and cents. The natural result of the mistake alluded to is to lead persons to underrate the value of their ideas. It is not at all uncommon to hear individuals exclaim, "What! get a patent on that thing!" in alluding to some little affair that can be carried in the pocket. That very despised "thing" will doubtless be the foundation of a good fortune, as many a similar article has been before it.

The improvement in some art or manufacture suggests itself to an individual, and he straightway applies it to his own use with very great advantage. Now, what shall he do? Patent it and secure the fruit of his genius to him-

self, or give it to the world without price? The business man would say the former; because if notoriety be the object, great patents confer not only means, but distinction, and where the first is attained, the second follows.

[From The Scientific American.]

A SPARKLING VANE.

A very curious and elegant vane for buildings may be made by placing in the centre a spiral or twisted spindle, as shown in the above cut. This spindle should be hung on delicate pivots, and the spaces between the spiral flanches nearly covered with small pieces of looking-glass or thin pieces of mica. The least breeze will put it in motion, and as the reflectors will assume every possible position, several of them will be sure to present the reflection of the sun at every revolution, from whatever point it may be viewed, thus producing a constant and very brilliant sparkling.

ELECTRICAL CONDUCTING POWER OF METALS.

The effect of the electrical discharge on metallic bodies is to raise their temperature to a less or greater degree, according to their conducting power. The best conductors are silver and copper; the poorest, lead; as will be seen from the subjoined table:

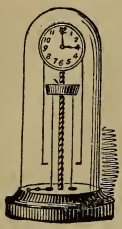
	Heat evolved.	Conducting Power.
Silver,	6	120
Copper,	6	120
Gold,	9	80
Zinc,	18	40
Platinum,	30	24
Iron,	30	24
Tin,	36	20
Lead,	72	12

[From The Scientific American.]

IMPORTANT TO INVENTORS.

The United States Patent Office at Washington contains nearly 50,000 models pertaining to patented inventions, all of which are open to public inspection and examination, together with the drawings and specifications relating thereto. But the distance of the Capital and the time and expense involved in a journey thither deter, in fact, the majority of inventors from reaping the advantages which a personal examination of previously patented inventions might oftentimes give them. To obviate this difficulty we (Munn & Co.) are in the habit of making these examinations at the Patent Office for inventors. When it is desired to ascertain definitely whether an invention, believed to be new, has been previously made, or to what extent, if any, it has been anticipated, the applicant sends to us a rough sketch and description of the device. We then make a thorough examination in the Patent Office at Washington, and report the result to the applicant. The charge for this service is only $5, and it is frequently the means of saving the applicant the entire expense of preparing a model, paying Government fees, etc., by revealing the fact that the whole or material portion of his improvement was previously known. This preliminary examination is sometimes also of importance in assisting to properly prepare the papers, so as to avoid conflicting with other inventions in the same class. The reader should carefully note the distinction made between this preliminary examination at the Patent Office and the examination and opinion given at our office, either orally or by letter, for which no fee is expected. It is only when a special search is made at the Patent Office that the fee of $5 is required. We are able, in a vast number of cases submitted to us, to decide the question of patentability without this special search. See page 6 of this little work.

When the air is exhausted from a pump-tube, (usually done by means of a piston,) the pressure of the atmosphere will cause the water to rise in the tube to a height of thirty feet.



"The Scientific American.—We are sure that if a few words of seasonable commendation should induce any of that large class of intelligent readers who can appreciate true merit, to subscribe for this excellent publication, we shall be abundantly rewarded in the conviction of having earned their gratitude. It is only recently that we have looked into its columns with any degree of regularity, and we take an early opportunity to express the extreme satisfaction and interest which we have experienced in doing so. To condense our idea of its most valuable characteristic into one sentence, we consider The Scientific American as embodying the highest function of all science, namely, its application to the practical, every-day concerns of life, in clear, pure, agreeable language. It will prove a pleasant guest and a useful companion at any fireside it may enter."—*Watchman, Greenport, L. I.*

The Scientific American ought to be taken, read, and studied by every intelligent man, young or old, worker or idler, rich or poor, in the country. It commends itself to every one, and is useful and interesting to all. The most scientific may learn from it, and the unscientific understand it. It has a peculiar charm about it that interests and affects every person with a grain of sense in his head. We are in the habit of sending our copy, after a thorough perusal, to the army, and the friend who receives it writes us, that he likes it better than any other paper; that it is longingly waited for, and eagerly read by his comrades, and never ceases its circulation until so bethumbed that its columns are no longer readable.—*Westchester County Journal.*

Remember that, by subscribing to The Scientific American, you receive, in the course of the year, an amount of reading matter nearly equal to *four thousand ordinary book pages.*

The light of lightning and its reflections, will penetrate from 150 to 200 miles.

HORSE-POWER.

When Watt began to introduce his steam-engines he wished to be able to state their power as compared with that of horses, which were then generally employed for driving mills. He accordingly made a series of experiments, which led him to the conclusion that the average power of a horse was sufficient to raise about 33,000 lbs. one foot in vertical height per minute, and this has been adopted in England and this country as the general measure of power.

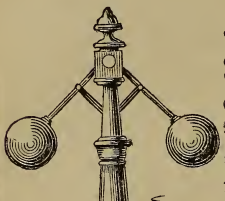
A waterfall has one horse-power for every 33,000 lbs. of water flowing in the stream per minute, for each foot of fall. To compute the power of a stream, therefore, multiply the area of its cross section in feet by the velocity in feet per minute, and we have the number of cubic feet flowing along the stream per minute. Multiply this by $62\frac{1}{2}$, the number of pounds in a cubic foot of water, and this by the vertical fall in feet, and we have the foot-pounds per minute of the fall; dividing by 33,000 gives us the horse-power.

For example: A stream flows through a flume 10 feet wide, and the depth of the water is 4 feet; the area of the cross section will be 40 feet. The velocity is 150 feet per minute—$40 \times 150 = 6000$=the cubic feet of water flowing per minute. $6000 \times 62\frac{1}{2} = 375{,}000$=the pounds of water flowing per minute. The fall is 10 feet; $10 \times 375{,}000 = 3{,}750{,}000$=the foot-pounds of the water-fall. Divide 3,750,000 by 33,000, and we have $113\frac{7}{33}$ as the horse-power of the fall.

The power of a steam-engine is calculated by multiplying together the area of the piston in inches, the mean pressure in pounds per square inch, the length of the stroke in feet, and the number of strokes per minute; and dividing by 33,000.

Water-wheels yield from 50 to 91 per cent of the water. The actual power of a steam-engine is less than the indicated power, owing to a loss from friction; the amount of this loss varies with the arrangement of the engine and the perfection of the workmanship.

ZUR BEACHTUNG FÜR DEUTSCHE ERFINDER.



Die Unterzeichneten haben eine Anleitung herausgegeben, welche angiebt was zu befolgen ist um ein Patent zu sichern, und selbige wird auf portofreie Anfrage gratis abgegeben.

Nach dem neuen Patent-Gesetze können Bürger aller Länder Patente in den Vereinigten Staaten zu denselben Bedingungen erlangen, wie die Bürger der Vereinigten Staaten selbst.

Munn & Co.,

No. 37 Park Row, New-York.

Scientific American Office.

A MOVING load has a much greater effect on a beam than a load at rest. For example, if the breaking weight of a beam is 4150 pounds, the load being at rest, a load of 1778 pounds, moved at 30 miles per hour, will break the same beam. The deflection of girders increases with the velocity of the load.

HEAT-CONDUCTING POWER OF DIFFERENT BODIES.

Gold,	1000	Tin,	304
Platinum,	981	Lead,	180
Silver,	973	Marble,	24
Copper,	898	Porcelain,	12
Iron,	374	Fire Clay,	11
Zinc,	363	Fire Brick,	11

RELATIVE CONDUCTING POWER OF FLUIDS.

Mercury,	1000	Proof Spirit,	312
Water,	357	Alcohol, (pure,)	232

[From the Scientific American.]

FIELD FOR CHEMICAL INVENTION.

Less than five per cent of all the patents issued are for chemical inventions. The first impression which this fact leaves is that the chemists are not so wide awake as the mechanics. And it seems, too, as if the chemists have the best chance, for they have the range of all the combinations, almost infinite in number, of all the sixty or more simple substances or elements, while the mechanic is limited in all his inventions to the use of only five mechanical elements. But this course of reasoning is a little unfair for the chemist, if we wish to determine his real merit as a benefactor of mankind. Thus far the introduction of new substances has been too slow and too much the result of chance. Illuminating gas was known as a chemical product for centuries before any use of it was made; iodine, chromine, chloroform, aniline, and a hundred other things, now common, were for a very long time only rare specimens on the shelves of the chemist's curiosity-shop, before they were found to be of the greatest value to men, and we cannot have a doubt that much more of the same kind of wealth is soon to be developed. May we not reasonably expect that virtues may be discovered in things now neglected, which will directly lead to the invention of arts more wonderful and more useful than photography or electro-telegraphing?

A correspondent, writing from Buffalo, says, in speaking of the value of The Scientific American to its host of readers: "I would as soon think of going without supper on Thursday night as to neglect to call at the book-store for the *Paper of papers;* and I am proud to say that I have influenced many others to 'go and do likewise.' I have my volumes complete and nicely bound from volume five; and should poverty ever compel me to sell my library, my *Bible* and my Scientific American should remain to grace the otherwise empty shelves."

THE PATENT LAWS OF THE UNITED STATES OF AMERICA.

PASSED JULY 8, 1870.

AN ACT to revise, consolidate, and amend the statutes relating to patents and copy-rights.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That there shall be attached to the Department of the Interior the office, heretofore established, known as the Patent-Office, wherein all records, books, models, drawings, specifications, and other papers and things pertaining to patents shall be safely kept and preserved.

OFFICERS, SALARIES, AND SURETIES.

SEC. 2. *And be it further enacted,* That the officers and employees of said office shall continue to be: one Commissioner of Patents, one Assistant Commissioner, and three examiners-in-chief, to be appointed by the President, and by and with the advise and consent of the Senate; one chief clerk, one examiner in charge of interferences, twenty-two principal examiners, twenty-two first-assistant examiners, twenty-two second-assistant examiners, one librarian, one machinist, five clerks of class four, six clerks of class three, fifty clerks of class two, forty-five clerks of class one,

and one messenger and purchasing clerk, all of whom shall be appointed by the Secretary of the Interior, upon nomination of the Commissioner of Patents.

SEC. 3. *And be it further enacted*, That the Secretary of the Interior may also appoint, upon like nomination, such additional clerks of classes two and one, and of lower grades, copyists of drawings, female copyists, skilled laborers, laborers, and watchmen, as may be from time to time appropriated for by Congress

SEC. 4. *And be it further enacted*, That the annual salaries of the officers and employees of the Patent-Office shall be as follows:

Of the Commissioner of Patents, four thousand five hundred dollars.

Of the Assistant Commissioner, three thousand dollars.

Of the examiners-in-chief, three thousand dollars each.

Of the chief clerk, two thousand five hundred dollars.

Of the examiner in charge of interferences, two thousand five hundred dollars.

Of the principal examiners, two thousand five hundred dollars each.

Of the first assistant examiners, one thousand eight hundred dollars each.

Of the second assistant examiners, one thousand six hundred dollars each.

Of the librarian, one thousand eight hundred dollars.

Of the machinist, one thousand six hundred dollars.

Of the clerks of class four, one thousand eight hundred dollars each.

Of the clerks of class three, one thousand six hundred dollars each.

Of the clerks of class two, one thousand four hundred dollars each.

Of the clerks of class one, one thousand two hundred dollars each.

Of the messenger and purchasing clerk, one thousand dollars.

Of laborers and watchmen, seven hundred and twenty dollars each.

Of the additional clerks, copyists of drawings, female

copyists, and skilled laborers, such rates as may be fixed by the acts making appropriations for them.

SEC. 5. *And be it further enacted*, That all officers and employees of the Patent-Office shall, before entering upon their duties, make oath for affirmation truly and faithfully to execute the trusts committed to them.

SEC. 6. *And be it further enacted*, That the Commissioner and chief clerk, before entering upon their duties, shall severally give bond, with sureties, to the Treasurer of the United States, the former in the sum of ten thousand dollars, and the latter in the sum of five thousand dollars, conditioned for the faithful discharge of their duties, and that they will render to the proper officers of the treasury a true account of all money received by virtue of their office.

DUTIES OF COMMISSIONER, AND OTHERS.

SEC. 7. *And be it further enacted*, That it shall be the duty of the Commissioner, under the direction of the Secretary of the Interior, to superintend or perform all the duties respecting the granting and issuing of patents which herein are, or may hereafter be, by law directed to be done; and he shall have charge of all books, records, papers, models, machines, and other things belonging to said office.

SEC. 8. *And be it further enacted*, That the Commissioner may send and receive by mail, free of postage, letters, printed matter, and packages relating to the business of his office, including Patent-Office reports.

SEC. 9. *And be it further enacted*, That the Commissioner shall lay before Congress, in the month of January, annually, a report giving a detailed statement of all moneys received for patents, for copies of records or drawings, or from any other source whatever; a detailed statement of all expenditures for contingent and miscellaneous expenses; a list of all patents which were granted during the preceding year, designating under proper heads the subjects of such patents; an alphabetical list of the patentees with their places of residence; a list of all patents which have been extended during the year; and such other information of the condition of the Patent-Office as may be useful to Congress or the public.

EXAMINERS-IN-CHIEF.

SEC. 10. *And be it further enacted*, That the examiners-in-chief shall be persons of competent legal knowledge and scientific ability, whose duty it shall be, on the written petition of the appellant, to revise and determine upon the validity of the adverse decisions of examiners upon applications for patents, and for reissues of patents, and in interference cases; and when required by the Commissioner, they shall hear and report upon claims for extensions, and perform such other like duties as he may assign them.

SEC. 11. *And be it further enacted*, That in case of the death, resignation, absence, or sickness of the Commissioner, his duties shall devolve upon the Assistant Commissioner until a successor shall be appointed, or such absence or sickness shall cease.

SEC. 12. *And be it further enacted*, That the Commissioner shall cause a seal to be provided for said office, with such device as the President may approve, with which all records or papers issued from said office, to be used in evidence, shall be authenticated.

MODELS.

SEC. 13. *And be it further enacted*, That the Commissioner shall cause to be classified and arranged in suitable cases, in the rooms and galleries provided for that purpose, the models, specimens of composition, fabrics, manufactures, works of art, and designs, which have been or shall be deposited in said office; and said rooms and galleries shall be kept open during suitable hours for public inspection.

SEC. 14. *And be it further enacted*, That the Commissioner may restore to the respective applicants such of the models belonging to rejected applications as he shall not think necessary to be preserved, or he may sell or otherwise dispose of them after the application has been finally rejected for one year, paying the proceeds into the treasury, as other patent moneys are directed to be paid.

SEC. 15. *And be it further enacted*, That there shall be purchased, for the use of said office, a library of such scientific works and periodicals, both foreign and American, as

may aid the officers in the discharge of their duties, not exceeding the amount annually appropriated by Congress for that purpose.

OFFICERS AND EMPLOYES NOT TO HOLD PATENTS.

SEC. 16. *And be it further enacted*, That all officers and employees of the Patent-Office shall be incapable, during the period for which they shall hold their appointments, to acquire or take, directly or indirectly, except by inheritance or bequest, any right or interest in any patent issued by said office.

SEC. 17. *And be it further enacted*, That for gross misconduct the Commissioner may refuse to recognize any person as a patent agent, either generally or in any particular case; but the reasons for such refusal shall be duly recorded, and be subject to the approval of the Secretary of the Interior.

SEC. 18. *And be it further enacted*, That the Commissioner may require all papers filed in the Patent-Office, if not correctly, legibly, and clearly written, to be printed at the cost of the party filing them.

SEC. 19. *And be it further enacted*, That the Commissioner, subject to the approval of the Secretary of the Interior, may from time to time establish rules and regulations, not inconsistent with law, for the conduct of proceedings in the Patent Office.

PATENTS.

SEC. 20. *And be it further enacted*, That the Commissioner may print or cause to be printed copies of the specifications of all letters-patent, and of the drawings of the same, and copies of the claims of current issues, and copies of such laws, decisions, rules, regulations, and circulars as may be necessary for the information of the public.

SEC. 21. *And be it further enacted*, That all patents shall be issued in the name of the United States of America, under the seal of the Patent Office, and shall be signed by the Secretary of the Interior and countersigned by the Commissioner, and they shall be recorded, together with the speci-

fication, in said office, in books to be kept for that purpose.

SEC. 22. *And be it further enacted*, That every patent shall contain a short title or description of the invention or discovery, correctly indicating its nature and design, and a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the said invention or discovery throughout the United States and the Territories thereof, referring to the specification for the particulars thereof; and a copy of said specifications and of the drawings shall be annexed to the patent and be a part thereof.

DATE OF PATENTS.

SEC. 23. *And be it further enacted*, That every patent shall date as of a day not later than six months from the time at which it was passed and allowed, and notice thereof was sent to the applicant or his agent; and if the final fee shall not be paid within that period, the patent shall be withheld.

WHAT MAY BE PATENTED.

SEC. 24. *And be it further enacted*, That any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or in any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the duty required by law, and other due proceedings had, obtain a patent therefor.

FOREIGN INVENTIONS MAY BE PATENTED.

SEC. 25. *And be it further enacted*, That no person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid, by rea-

son of its having been first patented or caused to be patented in a foreign country; provided the same shall not have been introduced into public use in the United States for more than two years prior to the application, and that the patent shall expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term; but in no case shall it be in force more than seventeen years.

DESCRIPTION AND SPECIFICATION.

SEC. 26. *And be it further enacted*, That before any inventor or discoverer shall receive a patent for his invention or discovery, he shall make application therefor, in writing, to the Commissioner, and shall file in the Patent-Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound, and use the same; and in case of a machine, he shall explain the principle thereof, and the best mode in which he has contemplated applying that principle so as to distinguish it from other inventions; and he shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery; and said specification and claim shall be signed by the inventor and attested by two witnesses.

DRAWINGS.

SEC. 27. *And be it further enacted*, That when the nature of the case admits of drawings, the applicant shall furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, which shall be filed in the Patent-Office; and a copy of said drawings, to be furnished by the Patent-Office, shall be attached to the patent as a part of the specification.

COMPOSITIONS.

SEC. 28. *And be it further enacted*, That when the inven-

tion or discovery is of a composition of matter, the applicant, if required by the Commissioner, shall furnish specimens of ingredients and of the composition, sufficient in quantity for the purpose of experiment.

MODELS.

SEC. 29. *And be it further enacted*, That in all cases which admit of representation by model, the applicant, if required by the Commissioner, shall furnish one of convenient size to exhibit advantageously the several parts of his invention or discovery.

OATH OF INVENTION.

SEC. 30. *And be it further enacted*, That the applicant shall make oath or affirmation that he does verily believe himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe that the same was ever before known or used; and shall state of what country he is a citizen. And said oath or affirmation may be made before any person in the United States authorized by law to administer oaths; or when the applicant resides in a foreign country, before any minister, chargé d'affaires, consul, or commercial agent, holding commission under the government of the United States, or before any notary public of the foreign country in which the applicant may be.

OFFICIAL EXAMINATION.

SEC. 31. *And be it further enacted*, That on the filing of any such application and the payment of the duty required by law, the Commissioner shall cause an examination to be made of the alleged new invention or discovery; and if on such examination it shall appear that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner shall issue a patent therefor.

COMPLETION OF APPLICATION.

SEC. 32. *And be it further enacted,* That all applications for patents shall be completed and prepared for examination within two years after the filing of the petition, and in default thereof, or upon failure of the applicant to prosecute the same within two years after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner that such delay was unavoidable

RIGHTS OF ASSIGNEES.

SEC. 33. *And be it further enacted,* That patents may be granted and issued or reissued to the assignee of the inventor or discoverer, the assignment thereof being first entered of record in the Patent-Office; but in such case the application for the patent shall be made and the specification sworn to by the inventor or discoverer; and also, if he be living, in case of an application for reissue.

PATENTS AFTER DECEASE OF INVENTOR.

SEC. 34. *And be it further enacted,* That when any person, having made any new invention or discovery for which a patent might have been granted, dies before a patent is granted, the right of applying for and obtaining the patent shall devolve on his executor or administrator, in trust for the heirs at law of the deceased, in case he shall have died intestate; or if he shall have left a will, disposing of the same, then in trust for his devisees, in as full manner and on the same terms and conditions as the same might have been claimed or enjoyed by him in his lifetime; and when the application shall be made by such legal representatives, the oath or affirmation required to be made shall be so varied in form that it can be made by them.

LAPSED AND REJECTED CASES.

SEC. 35. *And be it further enacted,* That any person who has an interest in an invention or discovery, whether as in-

ventor, discoverer, or assignee, for which a patent was ordered to issue upon the payment of the final fee, but who has failed to make payment thereof within six months from the time at which it was passed and allowed, and notice thereof was sent to the applicant or his agent, shall have a right to make an application for a patent for such invention or discovery the same as in the case of an original application: *Provided*, That the second application be made within two years after the allowance of the original application. But no person shall be held responsible in damages for the manufacture or use of any article or thing for which a patent, as aforesaid, was ordered to issue, prior to the issue thereof: *And provided further*, That when an application for a patent has been rejected or withdrawn, prior to the passage of this act, the applicant shall have six months from the date of such passage to renew his application, or to file a new one; and if he omit to do either, his application shall be held to have been abandoned. Upon the hearing of such renewed applications abandonment shall be considered as a question of fact.

ASSIGNMENTS, GRANTS, AND CONVEYANCES.

SEC. 36. *And be it further enacted*, That every patent or any interest therein shall be assignable in law, by an instrument in writing; and the patentee or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States; and said assignment, grant, or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless it is recorded in the Patent-Office within three months from the date thereof.

PURCHASERS' RIGHTS BEFORE PATENT.

SEC. 37. *And be it further enacted*, That every person who may have purchased of the inventor, or with his knowledge and consent may have constructed any newly invented or discovered machine, or other patentable article, prior to the application by the inventor or discoverer for a patent, or

sold or used one so constructed, shall have the right to use, and vend to others to be used, the specific things so made or purchased, without liability therefor.

PATENTED ARTICLES TO BE STAMPED.

SEC. 38. *And be it further enacted,* That it shall be the duty of all patentees, and their assigns and legal representatives, and of all persons making or vending any patented article for or under them, to give sufficient notice to the public that the same is patented, either by fixing thereon the word "patented," together with the day and year the patent was granted; or when, from the character of the article, this can not be done, by fixing to it or to the package wherein one or more of them is inclosed, a label containing the like notice; and in any suit for infringement, by the party failing so to mark, no damages shall be recovered by the plaintiff, except on proof that the defendant was duly notified of the infringement, and continued, after such notice, to make, use, or vend the article so patented.

PENALTY FOR FALSE MARKING.

SEC. 39. *And be it further enacted,* That if any person shall, in any manner, mark upon any thing made, used, or sold by him for which he has not obtained a patent, the name or any imitation of the name of any person who has obtained a patent therefor, without the consent of such patentee, or his assigns or legal representatives; or shall in any manner mark upon or affix to any such patented article the word "patent" or "patentee," or the words "letters-patent," or any word of like import, with intent to imitate or counterfeit the mark or device of the patentee, without having the license or consent of such patentee or his assigns or legal representatives; or shall in any manner mark upon or affix to any unpatented article the word "patent," or any word importing that the same is patented, for the purpose of deceiving the public, he shall be liable for every such offense to a penalty of not less than one hundred dollars, with costs; one moiety of said penalty to the person who shall sue for the same, and the other to the use of the United

States, to be recovered by suit in any district court of the United States within whose jurisdiction such offense may have been committed.

CAVEATS.

SEC. 40 *And be it further enacted*, That any citizen of the United States, who shall have made any new invention or discovery, and shall desire further time to mature the same, may, on payment of the duty required by law, file in the Patent-Office a caveat setting forth the design thereof, and of its distinguishing characteristics, and praying protection of his right until he shall have matured his invention; and such caveat shall be filed in the confidential archives of the office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof; and if application shall be made within the year by any other person for a patent with which such caveat would in any manner interfere, the Commissioner shall deposit the description, specifications, drawings, and model of such application in like manner in the confidential archives of the office, and give notice thereof, by mail, to the person filing the caveat, who, if he would avail himself of his caveat, shall file his description, specifications, drawings, and model within three months from the time of placing said notice in the post office in Washington, with the usual time required for transmitting it to the caveator added thereto, which time shall be indorsed on the notice. And an alien shall have the privilege herein granted, if he shall have resided in the United States one year next preceding the filing of his caveat, and made oath of his intention to become a citizen.

REJECTIONS.

SEC. 41. *And be it further enacted*, That whenever, on examination, any claim for a patent is rejected for any reason whatever, the Commissioner shall notify the applicant thereof, giving him briefly the reasons for such rejections, together with such information and references as may be useful in judging of the propriety of renewing his application or of altering his specification; and if, after receiving

such notice, the applicant shall persist in his claim for a patent, with or without altering his specifications, the Commissioner shall order a reëxamination of the case.

INTERFERENCES.

SEC. 42. *And be it further enacted,* That whenever an application is made for a patent which, in the opinion of the Commissioner, would interfere with any pending application, or with any unexpired patent, he shall give notice thereof to the applicants, or applicant and patentee, as the case may be, and shall direct the primary examiner to proceed to determine the question of priority of invention. And the Commissioner may issue a patent to the party who shall be adjudged the prior inventor, unless the adverse party shall appeal from the decision of the primary examiner, or of the board of examiners-in-chief, as the case may be, within such time, not less than twenty days, as the Commissioner shall prescribe.

AFFIDAVITS AND DEPOSITIONS.

SEC. 43. *And be it further enacted,* That the Commissioner may establish rules for taking affidavits and depositions required in cases pending in the Patent-Office, and such affidavits and depositions may be taken before any officer authorized by law to take depositions to be used in the courts of the United States, or of the State where the officer resides.

DUTY OF CLERK OF COURT.

SEC. 44. *And be it further enacted,* That the clerk of any court of the United States, for any district or territory wherein testimony is to be taken for use in any contested case pending in the Patent-Office, shall, upon the application of any party thereto, or his agent or attorney, issue subpœna for any witness residing or being within said district or territory, commanding him to appear and testify before any officer in said district or territory authorized to take depositions and affidavits, at any time and place in the subpœna stated; and if any witness, after being duly served with such subpœna, shall neglect or refuse to appear, or

after appearing shall refuse to testify, the judge of the court whose clerk issued the subpœna may, on proof of such neglect or refusal, enforce obedience to the process, or punish the disobedience as in other like cases.

FEES AND RIGHTS OF WITNESSES.

SEC. 45. *And be it further enacted*, That every witness duly subpœnaed and in attendance shall be allowed the same fees as are allowed to witnesses attending the courts of the United States, but no witness shall be required to attend at any place more than forty miles from the place where the subpœna is served upon him, nor be deemed guilty of contempt for disobeying such subpœna, unless his fees and traveling expenses in going to, returning from, and one day's attendance at the place of examination, are paid or tendered him at the time of the service of the subpœna; nor for refusing to disclose any secret invention or discovery made or owned by himself.

APPEALS.

SEC. 46. *And be it further enacted*, That every applicant for a patent or the reissue of a patent, any of the claims of which have been twice rejected, and every party to an interference, may appeal from the decision of the primary examiner, or of the examiner in charge of interference, in such case to the board of examiners-in chief, having once paid the fee for such appeal provided by law.

SEC. 47. *And be it further enacted*, That if such party is dissatisfied with the decision of the examiners-in-chief, he may, on payment of the duty required by law, appeal to the Commissioner in person.

SEC. 48. *And be it further enacted*, That if such party, except a party to an interference, is dissatisfied with the decision of the Commissioner, he may appeal to the supreme court of the District of Columbia, sitting in banc.

SEC. 49. *And be it further enacted*, That when an appeal is taken to the Supreme Court of the District of Columbia, the appellant shall give notice thereof to the Commissioner, and file in the Patent-Office, within such time as the Com-

missioner shall appoint, his reasons of appeal, specifically set forth in writing.

SEC. 50. *And be it further enacted*, That it shall be the duty of said court, on petition, to hear and determine such appeal, and to revise the decision appealed from in a summary way, on the evidence produced before the Commissioner, at such early and convenient time as the court may appoint, notifying the Commissioner of the time and place of hearing; and the revision shall be confined to the points set forth in the reasons of appeal. And after hearing the case, the court shall return to the Commissioner a certificate of its proceedings and decision, which shall be entered of record in the Patent-Office, and govern the further proceedings in the case. But no opinion or decision of the court in any such case shall preclude any person interested from the right to contest the validity of such patent in any court wherein the same may be called in question.

SEC. 51. *And be it further enacted*, That on receiving notice of the time and place of hearing such appeal, the Commissioner shall notify all parties who appear to be interested therein, in such manner as the court may prescribe. The party appealing shall lay before the court certified copies of all the original papers and evidence in the case, and the Commissioner shall furnish it with the grounds of his decision, fully set forth in writing, touching all the points involved by the reasons of appeal. And at the request of any party interested, or of the court, the Commissioner and the examiners may be examined under oath, in explanation of the principles of the machine or other thing for which a patent is demanded.

BILL IN EQUITY.

SEC. 52. *And be it further enacted*, That whenever a patent on application is refused, for any reason whatever, either by the Commissioner or by the supreme court of the District of Columbia upon appeal from the Commissioner, the applicant may have remedy by bill in equity; and the court having cognizance thereof, on notice to adverse parties and other due proceedings had, may adjudge that such applicant is entitled, according to law, to receive a patent

for his invention, as specified in his claim, or for any part thereof, as the facts in the case may appear. And such adjudication, if it be in favor of the right of the applicant, shall authorize the Commissioner to issue such patent, on the application filing in the Patent-Office a copy of the adjudication, and otherwise complying with the requisitions of law. And in all cases where there is no opposing party a copy of the bill shall be served on the Commissioner, and all the expenses of the proceeding shall be paid by the applicant, whether the final decision is in his favor or not.

REISSUES.

Sec. 53. *And be it further enacted*, That whenever any patent is inoperative or invalid, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new, if the error has arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, the Commissioner shall, on the surrender of such patent and the payment of the duty required by law, cause a new patent for the same invention, and in accordance with the corrected specification, to be issued to the patentee, or, in the case of his death or assignment of the whole or any undivided part of the original patent, to his executors, administrators, or assigns, for the unexpired part of the term of the original patent, the surrender of which shall take effect upon the issue of the amended patent; and the Commissioner may, in his discretion, cause several patents to be issued for distinct and separate parts of the thing patented, upon demand of the applicant, and upon payment of the required fee for a reissue for each of such reissued letters-patent. And the specifications and claim in every such case shall be subject to revision and restriction in the same manner as original applications are. And the patent so reissued, together with the corrected specification, shall have the effect and operation in law, on the trial of all actions for causes thereafter arising, as though the same had been originally filed in such corrected forms; but no new matter shall be introduced into the specification, nor in case of a machine patent shall the

model or drawings be amended, except each by the other; but when there is neither model nor drawing, amendments may be made upon proof satisfactory to the Commissioner that such new matter or amendment was a part of the original invention, and was omitted from the specification by inadvertence, accident, or mistake, as aforesaid.

DISCLAIMERS.

SEC. 54. *And be it further enacted*, That whenever, through inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, a patentee has claimed more than that of which he was the original or first inventor or discoverer, his patent shall be valid for all that part which is truly and justly his own, provided the same is a material or substantial part of the thing patented; and any such patentee, his heirs, or assigns, whether of the whole or any sectional interest therein, may, on payment of the duty required by law, make disclaimer of such parts of the thing patented as he shall not choose to claim or to hold by virtue of the patent or assignment, stating therein the extent of his interest in such patent; said disclaimer shall be in writing, attested by one or more witnesses, and recorded in the Patent-Office, and it shall thereafter be considered as part of the original specification to the extent of the interest possessed by the claimant and by those claiming under him after the record thereof. But no such disclaimer shall affect any action pending at the time of its being filed, except so far as may relate to the question of unreasonable neglect or delay in filing it.

INFRINGEMENT, SUITS FOR.

SEC. 55. *And be it further enacted*, That all actions, suits, controversies, and cases arising under the patent laws of the United States shall be originally cognizable, as well in equity as at law, by the circuit courts of the United States, or any district court having the powers and jurisdiction of a circuit court, or by the Supreme Court of the District of Columbia, or of any territory; and the court shall have power, upon bill in equity filed by any party aggrieved, to grant injunctions according to the course and

principles of courts of equity, to prevent the violation of any right secured by patent, on such terms as the court may deem reasonable; and upon a decree being rendered in any such case for an infringement, the claimant shall be entitled to recover, in addition to the profits to be accounted for by the defendant, the damages the complainant has sustained thereby, and the court shall assess the same or cause the same to be assessed under its direction, and the court shall have the same powers to increase the same in its discretion that are given by this act to increase the damages found by verdicts in actions upon the case; but all actions shall be brought during the term for which the letters-patent shall be granted or extended, or within six years after the expiration thereof.

APPEALS TO SUPREME COURT.

SEC. 56. *And be it further enacted*, That a writ of error or appeal to the Supreme Court of the United States shall lie from all judgments and decrees of any circuit court, or of any district court exercising the jurisdiction of a circuit court, or of the Supreme Court of the District of Columbia, or of any territory, in any action, suit, controversy, or case, at law or in equity, touching patent rights, in the same manner and under the same circumstances as in other judgments and decrees of such circuit courts, without regard to the sum of value in controversy.

RECORD EVIDENCE.

SEC. 57. *And be it further enacted*, That written or printed copies of any records, books, papers, or drawings belonging to the Patent-Office, and of letters-patent under the signature of the Commissioner or Acting Commissioner, with the seal of office affixed, shall be competent evidence in all cases wherein the originals could be evidence, and any person making application therefor, and paying the fee required by law, shall have certified copies thereof. And copies of the specifications and drawings of foreign letters-patent, certified in like manner, shall be *prima-facie* evidence of the fact of the granting of such foreign letters-patent, and of the date and contents thereof.

INTERFERENCE EQUITY PROCEEDINGS.

SEC. 58. *And be it further enacted,* That whenever there shall be interfering patents, any person interested in any of such interfering patents, or in the working of the invention claimed under either of such patents, may have relief against the interfering patentee, and all parties interested under him, by suit in equity against the owners of the interfering patent; and the court having cognizance thereof, as herein before provided, or notice to adverse parties, and other due proceedings had according to the course of equity, may adjudge and declare either of the patents void in whole or in part, or inoperative, or invalid in any particular part of the United States, according to the interest of the parties in the patent or the invention patented. But no such judgment or adjudication shall affect the rights of any person except the parties to the suit and those deriving title under them subsequent to the rendition of such judgment.

DAMAGES FOR INFRINGEMENT.

SEC. 59. *And be it further enacted,* That damages for the infringement of any patent may be recovered by action on the case in any circuit court of the United States, or district court exercising the jurisdiction of a circuit court, or in the Supreme Court of the District of Columbia, or of any territory, in the name of the party interested, either as patentee, assignee, or grantee. And whenever in any such action a verdict shall be rendered for the plaintiff, the court may enter judgment thereon for any sum above the amount found by the verdict as the actual damages sustained, according to the circumstances of the case, not exceeding three times the amount of such verdict, together with the costs.

PART INFRINGEMENT, SUIT FOR.

SEC. 60. *And be it further enacted,* That whenever, through inadvertence, accident, or mistake, and without any willful default or intent to defraud or mislead the public, a patentee shall have (in his specification) claimed to be the original and first inventor or discoverer of any material or

substantial part of the thing patented, of which he was not the original and first inventor or discoverer as aforesaid, every such patentee, his executors, administrators, and assigns, whether of the whole or any sectional interest in the patent, may maintain a suit at law or in equity for the infringement of any part thereof which was *bona fide* his own, provided it shall be a material and substantial part of the thing patented, and be definitely distinguishable from the parts so claimed, without right as aforesaid, notwithstanding the specifications may embrace more than that of which the patentee was the original or first inventor or discoverer. But in every such case in which a judgment or decree shall be rendered for the plaintiff, no costs shall be recovered unless the proper disclaimer has been entered at the Patent-Office before the commencement of the suit; nor shall he be entitled to the benefits of this section if he shall have unreasonably neglected or delayed to enter said disclaimer.

PLEADINGS IN INFRINGEMENT.

SEC. 61. *And be it further enacted*, That in any action for infringement the defendant may plead the general issue, and, having given notice in writing to the plaintiff or his attorney, thirty days before, may prove on trial any one or more of the following special matters:

First. That for the purpose of deceiving the public the description and specification filed by the patentee in the Patent-Office was made to contain less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; or,

Second. That he had surreptitiously or unjustly obtained the patent for that which was in fact invented by another, who was using reasonable diligence in adapting and perfecting the same; or,

Third. That it has been patented or described in some printed publication prior to his supposed invention or discovery thereof; or,

Fourth. That he was not the original and first inventor or discoverer of any material and substantial part of the thing patented; or,

Fifth. That it had been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public.

And in notice as to proof of previous invention, knowledge, or use of the thing patented, the defendant shall state he names of patentees and the dates of their patents, and when granted, and the names and residences of the persons alleged to have invented or to have had the prior knowledge of the thing patented, and where and by whom it had been used; and if any one or more of the special matters alleged shall be found for the defendant, judgment shall be rendered for him with costs. And the like defenses may be pleaded in any suit in equity for relief against an alleged infringement; and proofs of the same may be given upon like notice in the answer of the defendant, and with the like effect.

PATENT NOT VOID BECAUSE KNOWN IN A FOREIGN COUNTRY.

SEC. 62. *And be it further enacted*, That whenever it shall appear that the patentee, at the time of making his application for the patent, believed himself to be the original and first inventor or discoverer of the thing patented, the same shall not be held to be void on account of the invention or discovery, or any part thereof, having been known or used in a foreign country, before his invention or discovery thereof, if it had not been patented, or described in a printed publication.

EXTENSION OF PATENTS.

SEC. 63. *And be it further enacted*, That where the patentee of an invention or discovery, the patent for which was granted prior to the second day of March, eighteen hundred and sixty-one, shall desire an extension of his patent beyond the original term of its limitation, he shall make application therefor, in writing, to the commissioner, setting forth the reason why such extension should be granted; and he shall also furnish a written statement under oath of the ascertained value of the invention or discovery, and of his receipts and expenditures on account thereof, sufficiently in detail to exhibit a true and faithful ac-

count of the loss and profit in any manner accruing to him by reason of said invention or discovery. And said application shall be filed not more than six months nor less than ninety days before the expiration of the original term of the patent, and no extension shall be granted after the expiration of said original term.

SEC. 64. *And be it further enacted*, That upon the receipt of such application, and the payment of the duty required by law, the commissioner shall cause to be published in one newspaper in the city of Washington, and in such other papers published in the section of the country most interested adversely to the extension of the patent as he may deem proper, for at least sixty days prior to the day set for hearing the case, a notice of such application, and of the time and place when and where the same will be considered, that any person may appear and show cause why the extension should not be granted.

SEC. 65. *And be it further enacted*, That on the publication of such notice, the Commissioner shall refer the case to the principal examiner having charge of the class of inventions to which it belongs, who shall make to said Commissioner a full report of the case, and particularly whether the invention or discovery was new and patentable when the original patent was granted.

SEC. 66. *And be it further enacted*, That the Commissioner shall, at the time and place designated in the published notice, hear and decide upon the evidence produced, both for and against the extension; and if it shall appear to his satisfaction that the patentee, without neglect or fault on his part, has failed to obtain from the use and sale of his invention or discovery a reasonable remuneration for the time, ingenuity, and expense bestowed upon it, and the introduction of it into use, and that it is just and proper, having due regard to the public interest, that the term of the patent should be extended, the said Commissioner shall make a certificate thereon, renewing and extending the said patent for the term of seven years from the expiration of the first term, which certificate shall be recorded in the Patent-Office, and thereupon the said patent shall have the

same effect in law as though it had been originally granted for twenty-one years.

SEC. 67. *And be it further enacted*, That the benefit of the extension of a patent shall extend to the assignees and grantees of the right to use the thing patented to the extent of their interest therein.

OFFICIAL FEES.

SEC. 68. *And be it further enacted*, That the following shall be the rates for patent fees:

On filing each original application for a patent, fifteen dollars.

On issuing each original patent, twenty dollars.

On filing each caveat, ten dollars.

On every application for the reissue of a patent, thirty dollars.

On filing each disclaimer, ten dollars.

On every application for the extension of a patent, fifty dollars.

On the granting of every extension of a patent, fifty dollars.

On an appeal for the first time from the primary examiners to the examiners-in-chief, ten dollars.

On every appeal from the examiners-in-chief to the Commissioner, twenty dollars.

For certified copies of patents and other papers, ten cents per hundred words.

For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, one dollar; of over three hundred and under one thousand words, two dollars, of over one thousand words, three dollars.

For copies of drawings, the reasonable cost of making them.

SEC. 69. *And be it further enacted*, That patent fees may be paid to the Commissioner, or to the treasurer, or any of the assistant treasurers of the United States, or to any of the designated depositaries, national banks, or receivers of public money, designated by the Secretary of the Treasury for that purpose, who shall give the depositor a receipt or cer-

tificate of deposit therefor. And all money received at the Patent Office, for any purpose, or from any source whatever, shall be paid into the treasury as received, without any deduction whatever; and all disbursements for said office shall be made by the disbursing clerk of the Interior Department.

MONEY PAID BY MISTAKE RETURNED.

SEC. 70. *And be it further enacted,* That the treasurer of the United States is authorized to pay back any sum or sums of money to any person who shall have paid the same into the treasury, or to any receiver or depositary, to the credit of the treasurer, as for fees accruing at the Patent-Office through mistake, certificate thereof being made to said treasurer by the Commissioners of Patents.

DESIGN PATENTS.

SEC. 71. *And be it further enacted,* That any person who, by his own industry, genius, efforts, and expense, has invented or produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, or patented or described in any printed publication, may, upon payment of the duty required by law, and other due proceedings had the same as in cases of inventions or discoveries, obtain a patent therefor.

SEC. 72. *And be it further enacted,* That the Commissioner may dispense with models of designs when the design can be sufficiently represented by drawings or photographs.

SEC. 73. *And be it further enacted,* That patents for designs may be granted for the term of three years and six months, or for seven years, or for fourteen years, as the applicant may, in his application, elect.

SEC. 74. *And be it further enacted*, That patentees of designs issued prior to March two, eighteen hundred and sixty-one shall be entitled to extension of their respective patents for the term of seven years, in the same manner and under the same restrictions as are provided for the extension of patents for inventions or discoveries, issued prior to the second day of March, eighteen hundred and sixty-one.

SEC. 75. *And be it further enacted*, That the following shall be the rates of fees in design cases:

For three years and six months, ten dollars.

For seven years, fifteen dollars.

For fourteen years, thirty dollars.

For all other cases in which fees are required, the same rates as in cases of inventions or discoveries.

SEC. 76. *And be it further enacted*, That all the regulations and provisions which apply to the obtaining or protection of patents for inventions or discoveries, not inconsistent with the provisions of this act, shall apply to patents for designs.

TRADE-MARKS.

SEC. 77. *And be it further enacted*, That any person or firm domiciled in the United States, and any corporation created by the authority of the United States, or of any State or territory thereof, and any person, firm, or corporation resident of or located in any foreign country which by treaty or convention affords similar privileges to citizens of the United States, and who are entitled to the exclusive use of any lawful trade-mark, or who intend to adopt and use any trade-mark for exclusive use within the United States, may obtain protection for such lawful trade-mark by complying with the following requirements, to wit:

First. By causing to be recorded in the Patent-Office the names of the parties and their residences and place of business, who desire the protection of the trade-mark.

Second. The class of merchandise and the particular description of goods comprised in such class, by which the trade-mark has been or is intended to be appropriated.

Third. A description of the trade-mark itself, with fac-

similes thereof, and the mode in which it has been or is intended to be applied or used.

Fourth. The length of time, if any, during which the trade-mark has been used.

Fifth. The payment of a fee of twenty-five dollars, in the same manner and for the same purpose as the fee required for patents.

Sixth. The compliance with such regulations as may be prescribed by the Commissioner of Patents.

Seventh. The filing of a declaration, under the oath of the person, or of some member of the firm or officer of the corporation, to the effect that the party claiming protection for the trade-mark has a right to the use of the same, and that no other person, firm, or corporation has the right to such use, either in the identical form or having such near resemblance thereto as might be calculated to deceive, and that the description and fac-similes presented for record are true copies of the trade-mark sought to be protected.

DURATION OF TRADE-MARKS.

SEC. 78. *And be it further enacted*, That such trade-mark shall remain in force for thirty years from the date of such registration, except in cases where such trade-mark is claimed for and applied to articles not manufactured in this country and in which it receives protection under the laws of any foreign country for a shorter period, in which case it shall cease to have any force in this country by virtue of this act at the same time that it becomes of no effect elsewhere; and during the period that it remains in force it shall entitle the person, firm, or corporation registering the same to the exclusive use thereof so far as regards the description of goods to which it is appropriated in the statement filed under oath as aforesaid, and no other person shall lawfully use the same trade-mark, or substantially the same, or so nearly resembling it as to be calculated to deceive, upon substantially the same description of goods: *Provided*, That six months prior to the expiration of said term of thirty years, application may be made for a renewal of such registration, under regulations to be prescribed by the Commissioner of Patents, and the fee for such renewal

shall be the same as for the original registration; certificate of such renewal shall be issued in the same manner as for the original registration, and such trade-mark shall remain in force for a further term of thirty years: *And provided further*, That nothing in this section shall be construed by any court as abridging or in any manner affecting unfavorably the claim of any person, firm, corporation, or company to any trade-mark after the expiration of the term for which such trade-mark was registered.

DAMAGES FOR IMITATING TRADE-MARKS.

SEC. 79. *And be it further enacted*, That any person or corporation who shall reproduce, counterfeit, copy, or imitate any such recorded trade-mark, and affix the same to goods of substantially the same descriptive properties and qualities as those referred to in the registration, shall be liable to an action in the case for damages for such wrongful use of said trade-mark, at the suit of the owner thereof, in any court of competent jurisdiction in the United States, and the party aggrieved shall also have his remedy according to the course of equity to enjoin the wrongful use of his trade-mark and to recover compensation therefor in any court having jurisdiction over the person guilty of such wrongful use. The Commissioner of Patents shall not receive and record any proposed trade-mark which is not and can not become a lawful trade-mark, or which is merely the name of a person, firm, or corporation only, unaccompanied by a mark sufficient to distinguish it from the same name when used by other persons, or which is identical with the trade-mark appropriate to the same class of merchandise and belonging to a different owner, and already registered or received for registration, or which so nearly resembles such last-mentioned trade-mark as to be likely to deceive the public: *Provided*, That this section shall not prevent the registry of any lawful trade-mark rightfully used at the time of the passage of this act.

REGISTRATION OF TRADE-MARKS.

SEC. 80. *And be it further enacted*, That the time of the receipt of any trade-mark at the Patent-Office for registra-

tion shall be noted and recorded, and copies of the trade-mark and of the date of the receipt thereof, and of the statement filed therewith, under the seal of the Patent-Office, certified by the Commissioner, shall be evidence in any suit in which such trade-mark shall be brought in controversy.

TRANSFER OF TRADE-MARKS.

SEC. 81. *And be it further enacted*, That the Commissioner of Patents is authorized to make rules, regulations, and prescribe forms for the transfer of the right to the use of such trade-marks, conforming as nearly as practicable to the requirements of law respecting the transfer and transmission of copy-rights.

FRAUDULENT TRADE-MARKS.

SEC. 82. *And be it further enacted*, That any person who shall procure the registry of any trade-mark, or of himself as the owner thereof, or an entry respecting a trade-mark in the Patent-Office under this act, by making any false or fraudulent representations or declarations, verbally or in writing, or by any fraudulent means, shall be liable to pay damages in consequence of any such registry or entry to the person injured thereby, to be recovered in an action on the case before any court of competent jurisdiction within the United States.

SEC. 83. *And be it further enacted*, That nothing in this act shall prevent, lessen, impeach, or avoid any remedy at law or in equity, which any party aggrieved by any wrongful use of any trade-mark might have had if this act had not been passed.

SEC. 84. *And be it further enacted*, That no action shall be maintained under the provisions of this act by any person claiming the exclusive right to any trade-mark which is used or claimed in any unlawful business, or upon any article which is injurious in itself, or upon any trade-mark which has been fraudulently obtained, or which has been formed and used with the design of deceiving the public in the purchase or use of any article of merchandise.

REPEALING CLAUSE AND SCHEDULE.

SEC. 111. *And be it further enacted*, That the acts and parts of acts set forth in the schedule of acts cited, hereto annexed, are hereby repealed, without reviving any acts or parts of acts repealed by any of said acts, or by any clause or provision therein: *Provided, however*, That the repeal hereby enacted shall not affect, impair, or take away any right existing under any of said laws; but all actions and causes of action, both in law and in equity, which have arisen under any of said laws may be commenced and prosecuted; and, if already commenced, may be prosecuted to final judgment and execution, in the same manner as though this act had not been passed, excepting that the remedial provisions of this act shall be applicable to all suits and proceedings hereafter commenced: *And provided also*, That all applications for patents pending at the time of the passage of this act, in cases where the duty has been paid, shall be proceeded with and acted on in the same manner as though filed after the passage thereof: *And provided further*, That all offenses which are defined and punishable under any of said acts, and all penalties and forfeitures created thereby, and incurred before this act takes effect, may be prosecuted, sued for, and recovered, and such offenses punished according to the provisions of said acts, which are continued in force for such purpose.

Schedule of statutes cited and repealed, as printed in the Statutes at Large, including such portions only of the appropriation bills referred to as are applicable to the Patent-Office.

PATENTS.

Act of July 4, 1836, chapter 357, volume 5, page 117.
March 3, 1837, chapter 45, volume 5, page 191.
March 3, 1839, chapter 88, volume 5, page 353.
August 29, 1842, chapter 263, volume 5, page 543.
August 6, 1846, chapter 90, volume 9, page 59.
May 27, 1848, chapter 47, volume 9, page 231.
March 3, 1849, chapter 108, volume 9, page 395.
March 3, 1851, chapter 32, volume 9, page 617.

August 30, 1852, chapter 107, volume 10, page 75.
August 31, 1852, chapter 108, volume 10, page 76.
March 3, 1853, chapter 97, volume 10, page 209.
April 22, 1854, chapter 52, volume 10, page 276.
March 3, 1855, chapter 175, volume 10, page 643.
August 18, 1856, chapter 129, volume 11, page 81.
March 3, 1859, chapter 80, volume 11, page 410.
February 18, 1861, chapter 37, volume 12, page 130.
March 2, 1861, chapter 88, volume 12, page 246.
March 3, 1863, chapter 102, volume 12, page 796.
June 25, 1864, chapter 159, volume 13, page 194.
March 3, 1865, chapter 112, volume 13, page 533.
June 27, 1866, chapter 143, volume 14, page 76.
March 29, 1867, chapter 17, volume 15, page 10.
July 20, 1868, chapter 177, volume 15, page 119.
July 23, 1868, chapter 227, volume 15, page 168.
March 3, 1869, chapter 121, volume 15, page 293.

OCEAN waves rise from 20 to 22 feet in extreme height, at which altitude there are 3 in a mile and 4 per minute.

NEARLY all solids become luminous at 800 degrees of heat F.

MELTED snow produces from $\frac{1}{8}$ to $\frac{1}{4}$ of its bulk in water.

EFFECTS OF HEAT UPON BODIES.

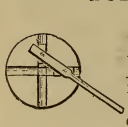
	Fahrenheit. Deg.		Fahrenheit Deg.
Cast-iron melts	2786	Cadmium	450
Gold "	2016	Tin melts	442
Copper "	1996	Tin and bismuth, equal parts, melts	283
Brass "	1900	Tin 8 parts, bismuth 5 parts, lead 2 parts, melt	212
Silver "	1873	Sodium	190
Red heat visible by day,	1077	Alcohol boils	174
Iron red hot in twilight,	884	Potassium	136
Common fire,	790	Ether "	98
Zinc melts	773	Human blood, (heat of,)	98
Iron, bright red in dark,	752	Strong wines freeze	20
Mercury boils	630	Brandy freezes	7
Lead melts	612	Mercury freezes	—39½
Linseed oil boils	600		
Bismuth melts	497		

PROPERTIES OF CHARCOAL.

Although charcoal is so combustible, it is, in some respects a very unchangeable substance, resisting the action of a great variety of other substances upon it. Hence posts are often charred before being put into the ground. Grain has been found in the excavations at Herculaneum, which was charred at the time of the destruction of that city, eighteen hundred years ago, and yet the shape is perfectly preserved, so that you can distinguish between the different kinds of grain. While charcoal is itself so unchangeable, it preserves other substances from change. Hence meat and vegetables are packed in charcoal for long voyages, and the water is kept in casks which are charred on the inside. Tainted meat can be made sweet by being covered with it. Foul and stagnant water can be deprived of its bad taste by being filtered through it. Charcoal is a great decolorizer. Ale and porter filtered through it are deprived of their color, and sugar-refiners decolorize their brown syrups by means of charcoal, and thus make white sugar. Animal charcoal, or bone-black, is the best for such purposes, although only one-tenth of it is really charcoal, the other nine-tenths being the mineral portion of the bone.

Charcoal will absorb, of some gases, from eighty to ninety times its own bulk. As every point of its surface is a point of attraction, it is supposed to account for the enormous accumulation of gases in the spaces of the charcoal. But this accounts for it only in part. There must be some peculiar power in the charcoal to change, in some way, the condition of a gas of which it absorbs ninety times its own bulk.—*Hooker.*

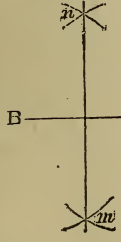
SUBSTITUTE FOR THE CRANK.



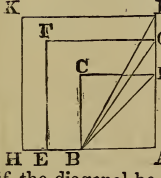
Various devices supposed to have advantages over the common crank, have been invented. Our diagram shows one of these forms, which has been re-invented many times, by different inventors. A grooved wheel is employed, and in the groove are two slides, attached respectively, by pivots, to the connecting rod of a piston rod. The reciprocating movement of the piston rod acting upon the connecting rod, causes the rotation of the wheel.

PRACTICAL GEOMETRY.

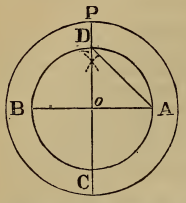
A KNOWLEDGE of geometry, both practical and theoretical, is of importance to mechanics and inventors. It is promotive of truth and patience in mental habits, and leads to the exercise of nicety and exactness in the execution of mechanical labors. With a pair of dividers, a rule and pencil, any person may speedily acquire a considerable knowledge of practical geometry. We subjoin a few simple and generally useful problems for practice, in the hope of thus interesting some of our readers in the subject, so that they will continue the study. Complete works on geometry can be had at the book-stores.



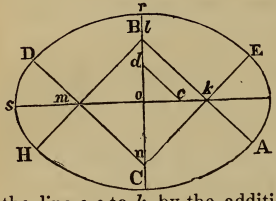
Problem 1.—To divide a line into equal parts.—To draw a line perpendicular to another: With a pair of dividers from the extremities of the line A B as centres, with any distance exceeding the point where the line is to be intersected, describe arcs cutting each other as *m n*; then a line drawn through *m n* will divide the line A B equally, and will also be perpendicular thereto.



Problem 2.—To find the side of a square that shall be any number of times the area of a given square: Let A B C D be the given square; then will the diagonal B D be the side of a square A E F G, double in area to the given square A B C D; the diagonal B D is equal to the line A G; if the diagonal be drawn from B to G, it will be the side of a square A H K L, three times the area of the square A B C D; the diagonal B L will equal the size of a square four times the area of the square A B C D, etc.



Problem 3.—To find the diameter of a circle that shall be any number of times the area of a given circle: Let A B C D be the given circle; draw the two diameters A B and C D at right angles to each other, and the cord A D will be the radius of the circle *o* P, twice the area of the given circle nearly; and half the cord will be the radius of a circle that will contain half the area, etc.



Problem 4.—To describe an ellipsis, the transverse and conjugate diameters being given: From *o*, as a centre, with the difference of the transverse and conjugate semi-diameters, set off *o c* and *o d*; draw the diagonal *c d*, and continue the line *o c* to *k*, by the addition of half the diagonal *c d*, then will the distance *o k* be the radius of the centres that will describe the ellipsis; draw the lines A B, C D, C E, and B H, cutting the semi-diameters of the ellipsis in the centres *k* B *m n*; then with the radius *m s*, and with *k*, and *m* as centres, describe the arcs D H and A E; also, with the radius *n r*, and with *n* and B as centres, describe the arcs E H and A H, and the figure A E D H will be the ellipsis required.

THE "SCIENTIFIC AMERICAN."—"It is hardly necessary for us to speak of its merits to those who are thoroughly posted up in the improvements of the age; but the general reading public may not be so well aware that it contains the finest engravings of all the late inventions—the new monitors, army and navy weapons, vessels, forts, machinery of all kinds, military and civil, mechanical and agricultural—with essays from the most distinguished scholars upon prac-

tical philosophy, chemistry, and engineering. It is indispensable to every inventor. It is useful for every family and housewife. In short, it is the best scientific and mechanical journal in the world, and we cannot see how any chemist, architect, engineer, farmer, or mechanic can do without it. MUNN & Co., Publishers, 37 Park Row, New York."—*Cass County Republican.*

MECHANICAL MOVEMENTS.

IN the construction of models, or machinery, the skillful mechanic and inventor will study to avoid clumsiness in the arrangement of parts, and will naturally take pride in selecting, as far as possible, the simplest and best forms of mechanical movements.

To this end, we have thought that nothing could be more suggestive or useful than a comprehensive exhibition of many of the best mechanical forms already known.

After much labor and expense, we have brought together, condensed and engraved expressly for this work, one of the most extensive series of mechanical movements ever before published.

Here the mechanic may find at a glance the movement suited for his purpose, and may see the separate parts best adapted to any special combination of mechanism.

As these engravings are not readily to be found elsewhere, we recommend the careful preservation of this book.

DESCRIPTION OF THE MECHANICAL MOVEMENTS BY NUMBERS.

1. Shaft coupling. 2. Claw coupling. 3, 4. Lever couplings. On the driving shaft, a disk with spurs is mounted, and to the shaft to be driven a lever is hinged. By causing this lever to catch in the spurs of the disk, the coupling is effected. 5. Knee or rose coupling, of which 26 is a side view.

6. Universal joint. 7, 8. Disk and spur coupling. 9. Prong and spur lever coupling.

10. Fast and loose pulley. 11. Sliding gear, the journal boxes of one of the wheels being moveable. 12. Friction clutch. By tightening or releasing a steel band, encircling a pulley on the shaft, the machinery is thrown in or out of

gear. 13, 14. Shoe and lever brakes. 15, 16. Change of motion by sheaves. 17. Spiral flanged shaft. 18. Connected with the rod are pawl links, catching into ratchet-teeth in the wheel to which rotary motion is to be imparted. When the rod moves in one direction, one of the pawls acts; and when the rod moves in the opposite direction, the other pawl acts in the same direction as the first. 19. The reciprocating motion of a rod is converted into rotary motion of the fly-wheel by a weight suspended from a cord, which passes over a small pulley that connects with a treadle, from which the motion is transmitted to the fly-wheel.

20. "Flying horse," used in fairs for amusement. By pulling the cords radiating from the crank, the persons occupying the seats or horses on the ends of the arms are enabled to keep the apparatus in motion. 21, 22. Bow string arrangements, to connect reciprocating into rotary motion. 23. Same purpose by differential screw. 24. The same by double rack and wheels. 25. Coupling for square shafts. 26. Side view of Fig. 5. 27. Sliding spur pulley coupling. 28. Lever with bearing roller to tighten pulley bands. 29. Chain wheel.

30. Reciprocating rectilinear into reciprocating rotary motion by two racks and cog wheel. 31. Oblique toothed wheels. 32. Worm and worm wheel. 33, 34. Claw coupling with hinged lever. 35, 36. Disk couplings, with lugs and cavities. 37. Disk coupling with screw bolts. 38, 39, 40. Shaft couplings.

41. Face view of Fig. 12. 42. Friction cones. 43. Friction pullies. 44. Self-releasing coupling. Disks with oblique teeth. If the resistance to the driven shaft increases beyond a certain point, the disks separate. 45. Hoisting blocks. 46. Elbow crank, for changing motion. 47. Reciprocating into rotary motion by zig-zag groove on cylinder. 48. Another form of Fig. 29. 49. Reciprocating into a rotary motion.

50. Same purpose. 51. Same purpose, by double rack and two ratchet pinions. When the double rack moves in one direction, one pinion is rigid with the shaft; when the rack moves in the opposite direction, the other pinion is rigid, and a continuous rotary motion is imparted to the fly-wheel shaft. 52. Reciprocating into oscillating. 53. Rotary into

reciprocating. By the action of the wheel pins, the carriage is moved in one direction, and by the action of said pins on an elbow-lever, it is moved in the opposite direction. 54. Stamp rod and lifting cam. 55. For giving reciprocating motion to rack. 56. Same motion to a bar with slot, by means of an eccentric pin projecting from a revolving disk, and catching in the slot. 57. Walking beam and fly-wheel. 58. Reciprocating motion to pump or other rod by means of eccentric disk and friction rollers. See 81 and 104. 59. Hoisting crane.

60. Friction gears. See 43. 61. Rotary into reciprocating by rising and falling pinion acting on endless rack. 62. By the revolving cam, a rising and falling or a reciprocating rectilinear motion is imparted to a drum. 63. Reciprocating motion to a frame by means of endless rack and pinion. 64. Reciprocating rectilinear motion to a toothed rack by a toothed segment on a lever-arm, which is subjected to the action of a weight, and of an eccentric wrist-pin, projecting from a revolving disk. 65. Reciprocating motion to a rod. The wheels are of different diameters, and consequently the rod has to rise and fall as the wheels revolve. (See 110.) 66. Cam and elbow lever. 67. Rod reciprocates by means of cam. 68. Revolving into reciprocating motion, by an endless segmental rack and pinion, the axle of which revolves and slides in a slot toward and from the rack. This rack is secured to a disk, and a rope round said disk extends to the body to which a reciprocating motion is to be imparted. 69. Elliptic gears.

70. Bevel gear. 71. Worm and worm wheel. 72. Transmitting motion from one axle to another, with three different velocities, by means of toothed segments of unequal diameters. 73. Continuous revolving into reciprocating, by a cam-disk acting on an oscillating lever. 74. Intermittent revolving motion to a shaft with two pinions, and segment gear wheel on end of shaft. 75. Oscillating lever, carrying pawls which engage teeth in the edges of a bar to which rectilinear motion is imparted. 76. Oscillating lever, connects by a link with a rod to which a rectilinear motion is imparted. 77. Oscillating lever and pawls, which gear in the ratchet-wheel. 78. Common treadle. 79. Describing on a revolving cylinder a spiral line of a certain given pitch

which depends upon the comparative sizes of the pinion and bevel-wheels.

80. Marking a spiral line, the graver moved by a screw. 81. (See Fig. 58.) 82. Plunger and rods. 83. Cross head and rods. 84. Reciprocating rod guided by friction rollers. 85. Revolving into reciprocating motion, by means of roller-arms, extending from a revolving shaft, and acting on lugs projecting from a reciprocating frame. 86. Crank motion. 87. Reciprocating motion by toothed wheel and spring bar. 88. The shaft carries a tapper, which catches against a hook hinged to the drum, so as to carry said drum along and raise the weight on the rope. When the tappet has reached its highest position, the hook strikes a pin, the hook disengages from the tappet, and the weight drops. 89. Reciprocating motion to a rod by means of a groove in an oblique ring secured to a revolving shaft.

90. Double crank. 91. Cam groove in a drum, to produce reciprocating motion. 92. Belts and pulleys. 93. Pulleys, belts, and internal gear. 94. As the rod moves up and down, the teeth of the cog-wheel come in contact with a pawl, and an intermittent rotary motion is imparted to said wheel. 95. By turning the horizontal axles with different velocities, the middle wheel is caused to revolve with the mean velocity. 96. Oscillating lever and cam groove in a disk. 97. Lazy tongs. 98. Oscillating segment and belt over pulleys. 99. Converting oscillating into a reciprocating motion by a cam-slot in the end of the oscillating lever which catches over a pin projecting from one of the sides of a parallelogram which is connected to the rod to which reciprocating motion is imparted.

100. Oscillating motion of a beam into rotary motion. 101. Motion of a treadle into rotary motion. 102. Double-acting beam. 103. Single-acting beam. 104. (See Figures 58 and 81.) 105. Device to steady a piston by a slotted guide-piece, operated by an eccentric on the driving-shaft. 106. Rod operated by two toothed segments. 107. Two cog-wheels of equal diameter, provided with a crank of the same length, and connected by links with a cross-bar to which the piston-rod is secured. 108. Device for a rectilinear motion of a piston-rod based on the hypocycloidal motion of a pinion in a stationary wheel with internal gear.

If the diameter of the pinion is exactly equal to one-half the diameter of the internal gear, the hypocycloid becomes a right line. 109. Same purpose as 56.

110. Action similar to 65. 111. Revolving motion by a circular sliding pinion gearing in an elliptical cog-wheel. 112. Similar to 96. 113. Carpenter's clamp. The jaws turn on their pivot-screws, and clamp the board. 114. An irregular vibratory motion is given to the arm carrying the wheel A, by the rotation of the pinion B. 115. Intermittent rotary motion of the pinion-shaft, by the continuous rotary motion of the large wheel. The part of the pinion shown next the wheel is cut on the same curve as the plain portion of the circumference, and, therefore, serves as a lock whilst the wheel makes a part of a revolution, and until the pin upon the wheel strikes the guide-piece upon the pinion, when the pinion-shaft commences another revolution. 116. Stop-motion used in watches to limit the number of revolutions in winding up. The convex curved part, a, b, of the wheel B, serving as the stop. 117. Several wheels, by connecting rods, driven from one pulley. 118. Intermittent circular motion is imparted to the toothed wheel by vibrating the arm B. When the arm, B, is lifted, the pawl is raised from between the teeth of the wheel, and traveling backward over the circumference again, drops between two teeth on lowering the arm, and draws with it the wheel. 119. Reciprocating rectilinear motion is given to the bar by the continuous motion of the cam. The cam is of equal diameter in every direction measured across its center.

120. Mechanism for revolving the cylinder in Colt's firearms. When the hammer is drawn back the dog, a, attached to the tumbler, acts on the ratchet, b, on the back of the cylinder, and is held up to the ratchet by a spring, c. 121. Alternate increasing and diminishing motion, by means of eccentric toothed wheel and toothed cylinder. 122. Oscillating or pendulum engine. The cylinder swings between trunnions like a pendulum. The piston-rod connects directly with crank. 123. Intermittent rotary motion. The small wheel is driven, and the friction rollers on its studs move the larger wheel by working against the faces of oblique grooves or projections across the face thereof. 124. Longitudinal and rotary motion of the rod is produced by

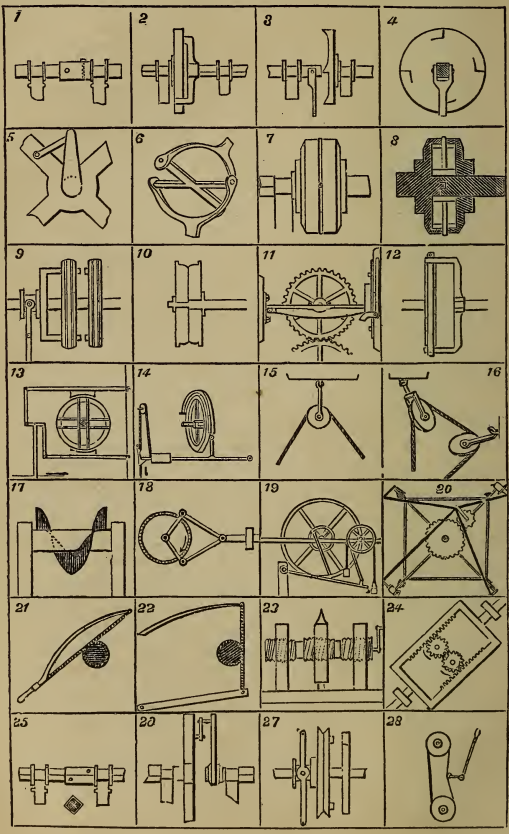
its arrangement between two rotating rollers, the axles of which are oblique to each other. 125. Friction indicator of Roberts. Upon the periphery of the belt-pulley a loaded carriage is placed, its tongue connected with an indicator. With a given load the indicating pointer remains in a given position, no matter what velocity is imparted to the pulley. When the load is changed the indicator changes, thus proving that the friction of wheels is in proportion to load, not velocity. 126. Circular intermittent rectilinear reciprocating motion. Used on sewing-machines for driving the shuttle; also on three-revolution cylinder printing-presses. 127. Continuous circular into intermittent circular motion. The cam is the driver. 128. Sewing-machine, four-motion feed. The bar, B, carries the feeding-points or spurs, and is pivoted to slide, A. B is lifted by a radial projection on cam C, which at the same time also carries A and B forward. A spring produces the return stroke, and the bar B, drops by gravity. 129. Patent crank motion, to obviate dead centers. Pressure on the treadle moves the slotted slide, A, forward until the wrist passes the center, when the spring, B, forces the slide against the stops until next forward movement.

130. Four-way cock. 131. One stroke of the piston gives a complete revolution to the crank. 132. Rectilinear motion of variable velocity, is given to the vertical bar by rotation of the shaft of the curved arm. 133. Pantagraph for copying, enlarging, and reducing plans, etc. C, fixed point. B, ivory tracing point. A, pencil trace, the lines to be copied with, and B, the pencil, will re-produce it double size. Shift the slide to which C is attached, also the pencil slide, and size of the copy will be varied. 134. Ball and socket joint for tubing. 135. Numerical registering device. The teeth of the worm shaft gear with a pair of worm-wheels of equal diameter, one having one tooth more than the other. If the first wheel has 100 teeth and the second 101, the pointers will indicate respectively 101 and 10.100 revolutions. 136 Montgolfier's hydraulic ram. The right hand valve being kept open by a weight or spring, the current flowing through the pipe in the direction of the arrow, escapes thereby. When the pressure of the water current overcomes the weight of the right valve, the momentum of the water opens the other valve, and the water passes into the air-chamber. On

equilibrium taking place, the left valve shuts and the right valve opens. By this alternate action of the valves, water is raised into the air-chamber at every stroke. 137. Rotary engine. Shaft, B, and hub, C, are arranged eccentric to the case. Sliding radial pistons, a, a, move in and out of hub, C. The pistons slide through rolling packings in the hub, C. 138. Quadrant engine. Two single-acting pistons, B, B, connect with crank, D. Steam is admitted to act on the outer sides of the pistons alternately through valve a, and the exhaust is between the pistons. 139. Circular into rectilinear motion. The scolloped wheel communicates motion to the horizontal oscillating rod, and imparts rectilinear movement to the upright bar. 140. Rotary motion transmitted by rolling contact between two obliquely arranged shafts.

MULTUM IN PARVO.

We have some queer correspondents: One writes to know if we will not be so good as to send a messenger to an address which he gives, up town—distance two and a half miles from our office—to make certain inquiries for him. It would require one and a half hours time to do the errand, and not a stamp inclosed. Another wants us to write a letter and tell him where to get a combined thermometer and barometer. Another, "will you be good enough to give me the names and addresses of several of the makers of the best brick machines;" another wants water wheels; another threshing machines; each writer desires our written opinion as to which is the best device, with our reasons, and not one is thoughtful enough to inclose a fee, or reflect that to answer his request will consume considerable of our time. Another party wishes us to write to him the recipe for making ornaments out of coal tar, where he can buy the mixture ready for use, and how much chequer-men will sell for in the New York market. For this information he sends us the generous sum of three cents in postage stamps. Mr. C. wants us to tell him of some valuable invention, of which he can buy the patent cheap, that would be suitable for him to take to sell, on his travels out West, by towns, counties, etc., three cents inclosed. Others want us to put them in communication with some person who will purchase an interest in their inventions, or manufacture for them, or furnish this or that personal information, our reply to be printed in the Scientific American. We are at all times happy to serve our correspondents, but if replies to purely personal errands are expected, a small fee, say from one to five dollars, should be sent.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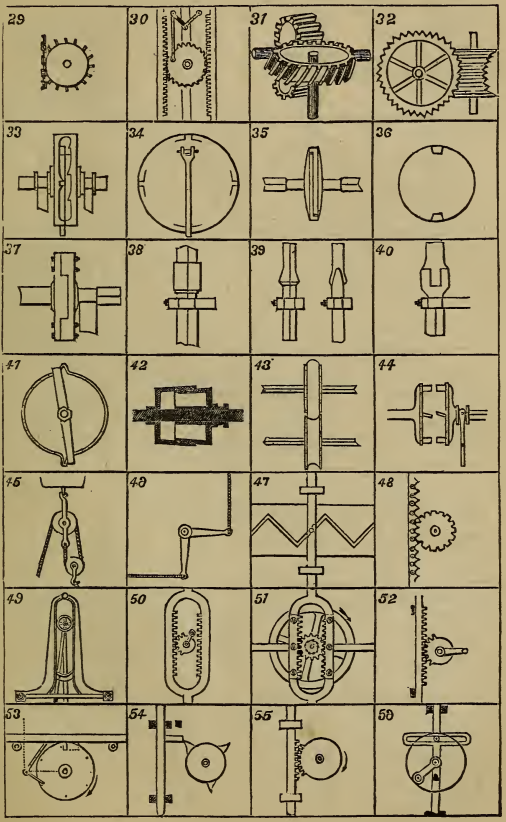
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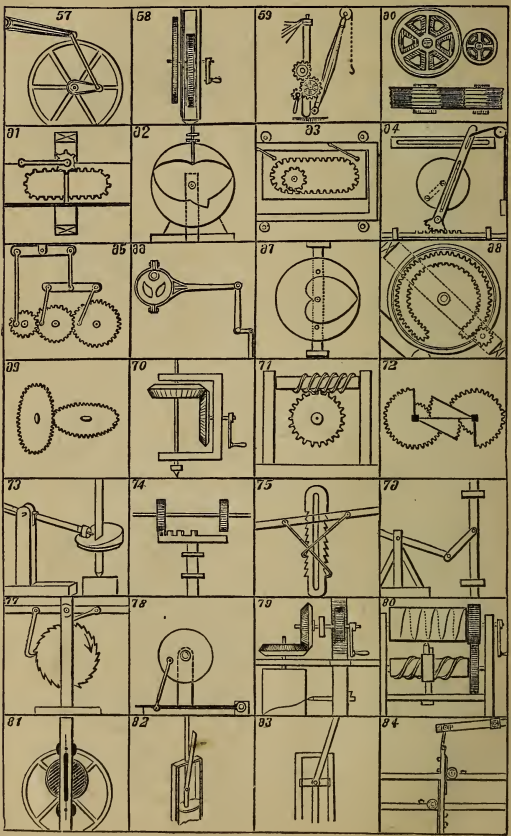
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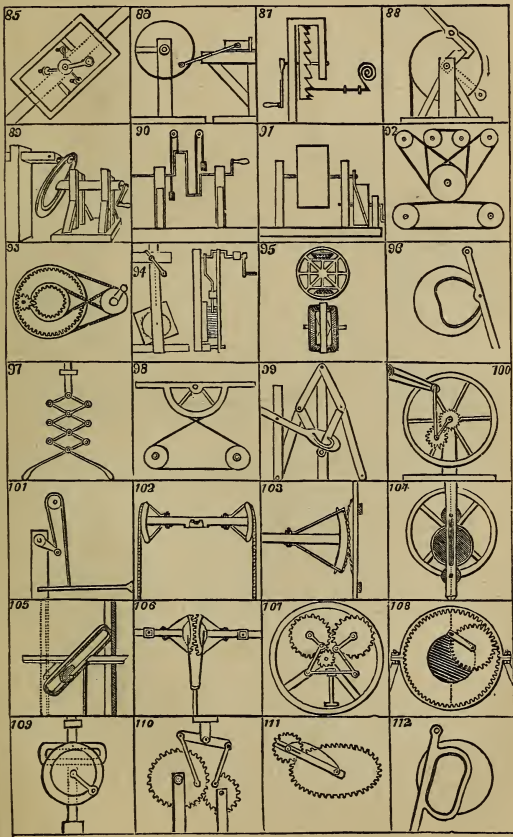
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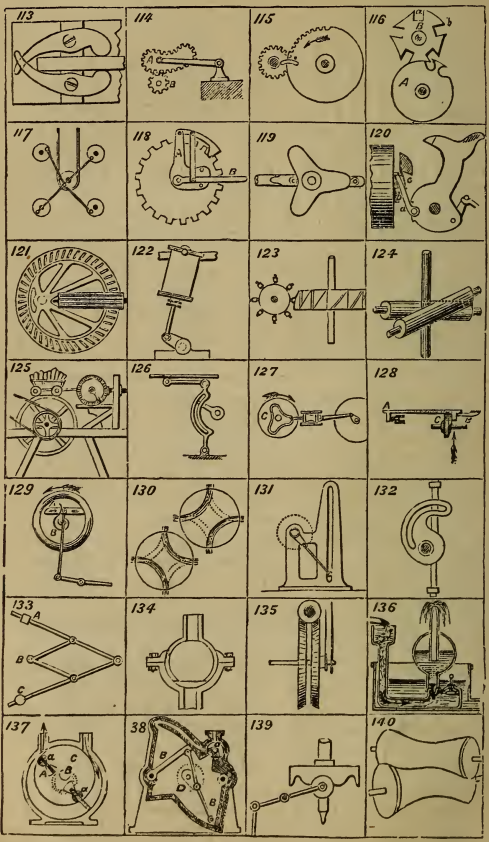
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WILL IT PAY?

On page 5, readers are informed that we are always happy to give them our opinion as to the novelty of their inventions, *without charge*. But some persons, when they send for such information, add many other inquiries, difficult to answer, and not included in our gratuitous invitation; as for example: "What is it worth? Who will buy? Will it pay? Does it infringe? Does it conflict with B's patent? If you will guarantee that it does not infringe, I will apply for a patent," etc.

It is impossible for us to answer all of these questions satisfactorily, but in special cases we might write out a reply if a fee were sent to compensate for our time. The following hints, however, may prove useful as a sort of general answer.

"What is it worth? Who will buy?" If a patent is refused, and cannot be obtained, the device is worth nothing, and no one will buy. Therefore the first thing to be considered, the first step to be taken, is to *obtain the Patent*. Do not count your chickens, nor anxiously seek a market for them, nor ask anybody to guarantee or insure their lives, before they are hatched.

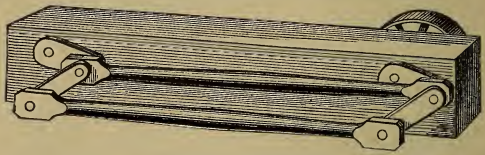
"Will it pay?" As a general rule, every patentable improvement will more than repay the small cost of taking out the patent. The sale of a single machine, or of a single right of use, will often bring back more than the whole outlay for the patent. The extent of profit frequently depends upon the business capacity of the inventor, or his agent. One man will make a fortune from an unpromising improvement, while another, possessing a brilliant invention, will realize little or nothing, owing to idleness and incompetence. [See remarks, page 42.]

"Does it infringe?" To answer this in each individual case, requires the special search mentioned at page 102. Infringement consists in the use, sale, or manufacture of the thing patented. It is not an infringement to take out or hold a patent for an improvement upon any other patent. It is not an infringement to sell rights under any patent, whether town, county or state rights, or licenses. The actual manufacture, sale, or use of an *article* may infringe; but the sale or purchase of *patent rights* is not infringement.

All good improvements are worth patenting, even if their use infringes a prior patent. Many an infringing device is worth more than the patent with which it conflicts. Patentees of conflicting inventions can usually make satisfactory arrangements with the owners of the prior patents; it is obviously to the interest of prior patentees to have their patents used as extensively as possible. The princely revenue of Howe, the inventor of the sewing machine, said to be five hundred thousand dollars annually, is derived from infringing patentees, who pay him a small royalty on each machine. The net profits divided among the owners of one of these infringing patents,—the celebrated Wheeler and Wilson—is reported to be more than one million dollars a year. We might give hundreds of analogous examples.

SUBSTITUTE FOR BELTS AND GEARS.

The object of this device is to transmit motion from one shaft to another, without the use of belt or gear wheels, both of which are in some instances objectionable.



Continuous rotary motion of the pulley shaft, is imparted to the secondary shaft through the connecting rods

STEAM PRESSURE AND TEMPERATURE.

Pressure in lbs. pr sq.in.	Correspond'g Temperature, Fahrenheit.	Pressure in lbs. per sq. in.	Correspond'g Temperature. Fahrenheit.	Pressure in lbs. per sq. in.	Correspond'g Temperature, Fahrenheit.
10	192.4	65	301.3	140	357.9
15	212.8	70	306.4	150	363.4
20	228.5	75	311.2	160	368.7
25	241.0	80	315.8	170	373.6
30	251.6	85	320.1	180	378.4
35	260.9	90	324.3	190	382.9
40	269.1	95	328.2	200	387.3
45	276.4	100	332.0	210	391.5
50	283.2	110	339.2	220	395.5
55	289.3	120	345.8	230	399.4
60	295.6	130	352.1	240	403.1

THE VALUE OF BRAINS.

WORKING as an ordinary hand in a Philadelphia ship-yard, until within a few years, was a man named John L. Knowlton. His peculiarity was, that while others of his class were at the ale-houses, or indulging in jollification, he was incessantly engaged in studying upon mechanical combinations. One of his companions secured a poodle-dog, and spent six months in teaching the quadruped to execute a jig upon his hind-legs. Knowlton spent the same period in discovering some method by which he could saw out ship timber in a beveled form.

The first man taught his dog to dance. Knowlton, in the same time, discovered a mechanical combination that enabled him to do in two hours the work that would occupy a dozen men, by slow and laborious processes, an entire day. That saw is now in use in all the ship-yards of the country. It cuts a beam to a curved shape as quickly as an ordinary saw-mill saw rips up a straight plank.

Knowlton continued his experiments. He took no part in parades or target-shootings, and in a short time afterward he secured a patent for a machine that turns any material whatever into a perfectly spherical form. He sold a portion of his patent for a sum that is equivalent to a fortune. The machine was used in cleaning off cannon-balls for the government.

When the ball comes from the mould, the surface is incrusted, and the ordinary process of smoothing it was slow and wearisome. This machine almost in an instant, and with mathematical accuracy, peels it to the surface of the metal, at the same time smoothing out any deviations from the perfect spheroidal form.

The same unassuming man has invented a boring-machine, that was tested in the presence of a number of scientific gentlemen. It bored at the rate of twenty-two inches an hour, through a block of granite, with a pressure of but three hundred pounds upon the drill. A gentleman present offered him ten thousand dollars upon the spot for a part interest in the invention, in Europe, and the offer was then accepted.

The moral of all this is, that people who keep on studying

are sure to achieve something. Mr. Knowlton doesn't consider himself by any means brilliant; but if once inspired with an idea, he pursues it until he forces it into tangible shape. If every body would follow copy, the world would be less filled with idlers, and the streets with grumblers and malcontents.

ENGRAVINGS AND ADVERTISING.

EXPERIENCE shows that the illustration of inventions by engravings is one of the best means ever devised for the introduction of inventions and the sale of patents. As a means for the circulation of such illustrations, nothing can compare in value with the *Scientific American*. Every engraving published therein goes before probably not less than *one hundred and fifty thousand persons*.

All good business men, before spending their money upon advertising, are in the habit of inquiring about the character and extent of circulation enjoyed by the journal that solicits their patronage. In this respect the publishers of the *Scientific American* challenge the closest scrutiny; the facts will show that their terms are much lower than those of any other journal of the same class in proportion to the extent of circulation.

Parties who desire to have their machines illustrated can address the undersigned, who are also prepared to send artists to make sketches of manufacturing establishments, with a view to their publication in the *Scientific American*.

MUNN & CO.,
37 Park Row, New-York.

SOAP-BUBBLES.

FEW things amuse children more than blowing bubbles. Dissolve a quarter of an ounce of Castile or oil soap, cut up in small pieces, in three quarters of a pint of water, and boil it for two or three minutes; then add five ounces of glycerine. When cold, this fluid will produce the best and most lasting bubbles that can be blown.

GOING TO WASHINGTON IN PERSON.

Some inventors suppose, very naturally, that if personally present in Washington, they can get their cases through more expeditiously, or command other important facilities. But this is not so. The journey to Washington is usually a mere waste of time and money. A good agent must be employed after the inventor gets there. *No inventor can possibly have facilities or influence superior to our own;* more than one third of the entire business of the Patent Office passes through our hands; and we have an office in Washington, charged with the especial duty of watching over and pressing forward the interests of our clients.

The Patent Office does not prepare patent papers, or make models. These must be provided by the applicant or his attorney, according to law, *otherwise his claim will not be considered.*

The law especially requires that all documents deposited in the Patent Office shall be correctly, legibly, and clearly written, and that the drawings shall be of a specified size, and executed in an artistic manner.

Persons who visit Washington in person, can have all their patent business *promptly attended to*, by calling at Munn & Co.'s Branch Scientific American Office, corner of 7th and F streets, opposite the Patent Office.

COPIES OF PATENTS, CLAIMS, ETC.

We furnish full copies of specifications or drawings of any existing patent, or open rejected case, official letter, assignment, etc., etc. The expense is very moderate. For $1 we can send a copy of the *claims only*, of any existing patent, provided the date or number of the patent is given. But when we have to search up the patent, date or number not being given, the charge is increased.

INFRINGEMENTS.

THE general rule of law is, that the prior patentee is entitled to a broad interpretation of his claims. The scope of any patent is therefore governed by the inventions of prior date. To determine whether the use of a patent is an infringement of another, generally requires a most careful study of all analogous prior patents and rejected applications. An opinion based upon such study requires for its preparation much time and labor.

Having access to all the patents, models, public records, drawings, and other documents pertaining to the Patent Office, we are prepared to make examinations, and give opinions upon all infringement questions, advice as to the scope and ground covered by patents, and direct with vigor any legal proceedings therewith connected. Address, MUNN & Co., 37 Park Row, N. Y.

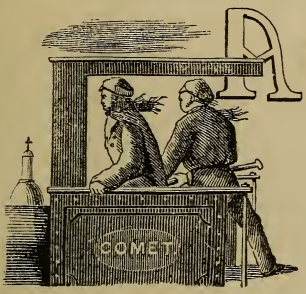
The expense of these examinations, with written opinion, varies from $25 to $100 or more, according to the labor involved.

To the Editors of The Scientific American:

Let me encourage you, gentlemen, in your great enterprise. Perhaps we need light and elegant literature; we may even need "chess columns;" but let THE SCIENTIFIC AMERICAN continue to teach the people how to realize Dean Swift's prayer—"Make *two* blades of grass grow on the spot where only *one* grew before." Let it still increase the mechanical and agricultural knowledge of our artisans and farmers, by publishing the latest discoveries in science and improvements in the arts. And then its editors will have the noblest reward—that of being considered the guardian angels of genius, the champions of inventors, and the "prime motors" employed in developing the highest physical and intellectual resources of this great country.

Camden, Ark. W. A. SHAW, M.D.

QUICK APPLICATIONS.



When, from any reason, parties are desirous of applying for a Patent or filing a Caveat in great haste, without a moment's loss of time, they have only to write or telegraph to us, and we will make special exertions. In many cases, we can prepare the papers at an hour's notice.

But our correspondents must remember that we can not send them blank papers for signature and oath, as this is forbidden by the Commissioner of Patents.

All persons without any distinction as to nationality can take American Patents on the same terms as citizens.

Caveats can only be filed by citizens and those who have resided in this country a year and declared their intentions to become citizens. Foreigners can not file Caveats.

THE INVENTOR MUST APPLY FOR THE PATENT.

It is necessary, in all cases, that an application for a patent should be made in the name of the inventor, and the petition and specification must be signed by him. An inventor may appoint an attorney, or may sell and assign all his interest in an invention; still the patent papers, on making the application, must be signed and sworn by the inventor; otherwise they will not be received by the Commissioner of Patents.

Remember that self-interest is more likely to warp your judgment than all other circumstances combined; therefore, look well to your duty when your interest is concerned.

A WORD TO INQUIRERS.

We frequently receive letters containing long strings of trifling questions, relative to all sorts of things, without any fee to pay us for our time in obtaining the information, nor even stamps for postage or stationery. Many of these correspondents close their letters with the comforting assurance that "I would remit for your trouble, but do not know how much to send." To relieve the consciences of all such doubters, we would recommend them to send a dollar or more, according to the value to them of the desired information. If the latter is of no value, they ought not to trouble us with their fly-tracks.

To certain other classes of inquirers the following hints may be useful: The best washing-machines, the best straw-cutters, the best churns, the best brick-machines, the best engines, the best sewing-machines, the best of every thing in the mechanical line, is advertised and illustrated in The Scientific American, and the address of the parties having such things on sale is there given. Write directly to them for the information you want, and spare us. If you cannot at first find what you desire, read the back numbers of The Scientific American. Do not expect us to do the work for you unless you send a small remittance.

To find the area of an ellipsis, multiply the long diameter by the short diameter and by .7854; the product will be the area.

Never relate your misfortunes, and never grieve over what you cannot prevent.

To find the area of a circle, multiply the square of the diameter by the decimal .7854. Or multiply the circumference by the radius, and divide the product by 2.

[From The Scientific American.]

RELATING TO PATENTS.

IT may be well for parties who are interested in new inventions to remember that our firm of Munn & Co. have taken out far more patents, and have, therefore, had much greater experience in the profession, than any other agency in the world. Those who confide their business to us may therefore rely upon having it done in the best manner on the most moderate terms.

In addition to these advantages, we make it a general rule to assist the interest of our clients by giving publicity in the form of editorial notices, of all the new and meritorious inventions that are patented through our agency. The fact that we have carefully studied these improvements during the process of preparing the patent papers, enables us to speak knowingly in regard to their best features. The publicity thus given to inventions, owing to the immense circulation of THE SCIENTIFIC AMERICAN among intelligent readers, is often of the utmost benefit to patentees. In some cases it has engaged the active coöperation of enterprising capitalists and manufacturers, in patents which otherwise would have remained dead, and has resulted in the most important pecuniary advantages to inventors and patentees, as hundreds of them are ready to testify; although the sum total of our charges for preparing their patent papers has rarely exceeded the small amount of twenty-five dollars. Whatever carping, jealous, or envious persons, or little agents, may say to the contrary, we are justified in affirming that all who really wish to promote their own interests will do well to employ THE SCIENTIFIC AMERICAN PATENT AGENCY.

MINERAL CONSTITUENTS ABSORBED OR REMOVED FROM AN ACRE OF SOIL BY THE FOLLOWING CROPS.

	Wheat, 25 bushels.	Barley, 40 bushels.	Turnips, 20 tons.	Hay, 1½ tons.
	Lbs.	Lbs.	Lbs.	Lbs.
Potassa	29.6	17.5	47.1	38.2
Soda	3.	5.2	8.2	12.
Lime	12.9	17.	29.9	44.5
Magnesia	10.6	9 2	19.7	7.1
Oxide of Iron	2.6	2.1	7.1	.6
Phosphoric Acid.	20.6	25.8	46.3	15.1
Sulphuric Acid	10.6	2 7	13.3	9.2
Chlorine	2.	16.	3.6	4.1
Silica	118.1	129.5	247.8	78.2
Alumina	.....	2.4	.....	.....
Total	210.00	213.00	423.00	209.00

SOUND

Is the effect produced upon the ear when air is set in motion within certain limits of rapidity. Audible sound begins when about thirty-two vibrations per second are made, and ceases when about 8000 vibrations per second are reached.

The number of vibrations corresponding with the middle C of a musical instrument is 522 per second. An octave below, half the number; an octave above, twice the number.

Sound travels at the rate of 1100 feet per second in a still atmosphere. The distance in feet between an observer and the point where a stroke of lightning falls, may be known by multiplying 1100 by the number of seconds that elapse after the flash is seen until the sound is heard.

A MESSIEURS LES INVENTEURS FRANCAIS.

Les inventeurs français non familiers avec la langue anglaise et qui préféreraient nous communiquer leurs inventions en français, peuvent nous addresser dans leur langue natale. Envoyez nous un dessein et une description concise pour notre examen. Toutes communications seront reçues en confidence. Chaque personne, soit native ou etrangère, une seule exception, peut obtenir une patente dans les Etats Unis sous les mêmes conditions que les citoyens. On parle français dans nôtre bureau. Munn & Co.,

37 Park Row, New-York, Scientific American Office.

CENSUS

OF THE

UNITED STATES, BY COUNTIES, FOR 1870.

ALABAMA.—Area, 50,722 square miles.

Autauga	11,623	Clay	9,560	Fayette	7,166
Baker	6,194	Cleburne	8,017	Franklin	8,006
Baldwin	6,004	Coffee	6,171	Geneva	2,939
Barbour	29,309	Colbert	12,537	Greene	18,399
Benton		Conecuh	9,574	Hancock	
Bibb	7,469	Coosa	11,945	Hale	21,792
Blount	9,945	Covington	4,868	Henry	14,191
Bullock	24,474	Crenshaw	11,156	Jackson	19,410
Butler	14,981	Dale	11,325	Jefferson	12,345
Calhoun	13,979	Dallas	40,705	Lauderdale	15,092
Chambers	17,562	De Kalb	7,126	Lawrence	16,658
Cherokee	11,132	Elmore	14,477	Lee	21,750
Choctaw	12,676	Escambia	4,041	Limestone	15,017
Clark	14,629	Etowah	10,109	Total	

Lowndes	25,719	Randolph	12,006
Macon	17,727	Russell	21,636
Madison	31,267	Sanford	8893
Marengo	26,151	Shelby	12,218
Marion	6,059	St. Clair	9,360
Marshall	9,871	Sumter	24,110
Mobile	49,311	Talladega	18,063
Montgom'y	43,704	Tallapoosa	16,963
Morgan	12,187	Tuscaloosa	20,981
Monroe	14,214	Walker	6,543
Perry	24,975	Washington	3,912
Pickens	17,690	Wilcox	28,377
Pike	17,423	Winston	4,155
			996,988

ARKANSAS.—Area, 52,198 square miles.

Arkansas	8,268	Craighead	4,577	Izard	6,806
Ashley	8,042	Cross	3,915	Jackson	7,268
Benton	13,831	Dallas	5,707	Jefferson	15,733
Boone	7,032	Desha	6,125	Johnson	9,132
Bradley	8,646	Drew	9,960	Lafayette	9,129
Calhoun	3,843	Franklin	9,627	Lawrence	5,981
Carroll	5,780	Fulton	4,843	Little River	3,236
Chicot	7,214	Grant	3,943	Madison	7,927
Clark	11,953	Green	7,573	Marion	3,979
Columbia	11,397	Hempstead	13,768	Mississippi	3,633
Conway	8,112	Hot Springs	5,877	Monroe	8,336
Crawford	8,957	Independence	14,566	Montgom'y	2984
Crittenden	3,831	Total			

Newton	3,364	Saline	3,911
Ouachita	12,975	Scott	7,483
Perry	2,685	Searcy	5,614
Phillips	15,372	Sebastian	12,940
Pike	3,788	Sevier	4,492
Poinsett	1,720	Sharpe	5,400
Polk	3,376	Union	10,571
Pope	8,409	Van Buren	5,107
Prairie	5,604	Washing'n	17,266
Pulaski	32,066	White	10,346
Randolph	7,466	Woodruff	6,891
St. Francis	6,714	Yell	8,048
			483,179

CALIFORNIA.—Area, 188,981 square miles.

Alameda	24,237	Humboldt	6,143	Merced	2,807
Alpine	685	Inyo	1,956	Mono	430
Amador	9,582	Kern	2,925	Monterey	9,876
Butte	11,403	Klamath	1,686	Napa	7,163
Calaveras	8,895	Lake	2,969	Nevada	19,136
Colusa	6,165	Lassen	1,324	Placer	11,357
Contra Costa	8,461	Los Angelos	15,309	Plumas	4,489
Del Norte	2,022	Marin	6,903	Sacramento	26,831
El Dorado	10,309	Mariposa	4,572	S. Bernar'o	8,398
Fresno	6,336	Mendocino	7,545	San Diego	4,974
		Total			

S. Franc'o	149,482	Solano	16,871
S. Joaquin	21,050	Sonoma	19,819
S. L. Obispo	4,772	Stanislaus	6,499
S. Mateo	6,635	Sutter	5,030
S. Barbara	7,784	Tehoma	3,587
S. Clara	26,246	Trinity	3,213
S. Cruz	8,743	Tulare	4,533
Shasta	4,173	Tuolumne	8,150
Sierra	5,619	Yolo	9,899
Siskiyou	6,848	Yuba	10,851
			560,285

CONNECTICUT.—Area, 4,674 square miles.

Fairfield	95,276	Litchfield	48,727	N. Haven	121,257
Hartford	109,007	Middlesex	36,809	N. London	66,534

Tolland	22,000	Windham	38,518
Total			537,418

DELAWARE.—Area, 2,120 square miles.

Kent	29,804	N. Castle	63,515	Sussex	31,696

Total	125,015

FLORIDA.—Area, 59,268 square miles.

Alachua	17,328	Duval	11,921	Jackson	9,528
Baker	1,325	Escambia	7,825	Jefferson	13,398
Benton		Franklin	1,256	Lafayette	1,783
Bradford	3,671	Gadsden	36,802	Leon	15,233
Brevard	1,216	Hamilton	5,749	Levy	2,017
Calhoun	908	Hernando	2,938	Liberty	1,050
Clay	2,098	Hillsboro	3,215	Madison	11,121
Columbia	7,335	Holmes	1,572	Manatee	1,931
Dade	85	Total			

Marion	10,804	St. Johns	2,618
Monroe	5,657	Sumter	2,952
Nassau	4,247	Suwanee	3,556
New River		Taylor	1,443
Orange	2,195	Volusia	1,723
Polk	3,159	Wakulla	2,505
Putnam	3,821	Walton	3,050
S. Rosa	3,312	Washing'n	2,302
			187,750

GEORGIA.—Area, 58,000 square miles.

Appling	5,086	Bullock	5,610	Charlton	1,897
Baker	6,843	Burke	14,586	Chatham	41,279
Baldwin	10,618	Butts	6,941	Chattah'ee	6,059
Banks	4,973	Calhoun	5,503	Chatooga	6,902
Bartow	16,566	Camden	4,613	Cherokee	10,399
Berrien	4,518	Campbell	9,176	Clarke	12,941
Bibb	21,255	Carroll	11,782	Clay	5,493
Brooks	8,342	Cass		Clayton	5,477
Bryan	5,252	Catoosa	4,409	Clinch	3,945

Cobb	13,814	De Kalb	10,014
Coffee	3,192	Dooley	9,790
Colquitt	1,654	Dougherty	11,514
Columbia	13,529	Early	6,998
Coweta	15,875	Echols	1,978
Crawford	7,657	Effingham	4,214
Dade	3,033	Elbert	9,249
Dawson	4,369	Emanuel	6,143
Decatur	15,183	Fannin	5,429

Fayette ... 8,221	Henry 10,102	Merriwet'r. 13,756	Quitman .. 4,150	Troup 17,632
Floyd 17,230	Houston ... 20,406	Miller 3,091	Rabun 3,256	Twiggs..... 8,545
Forsyth ... 7,983	Irwin 1,837	Milton..... 4,284	Randolph .. 10,561	Union 5,267
Franklin .. 7,893	Jackson ... 11,181	Mitchell .. 6,633	Richmond .. 25,137	Upson 9,430
Fulton 3,346	Jasper 10,439	Monroe.... 17,213	Schley 5,129	Walker 9,955
Gilmer 6,644	Jefferson .. 12,192	Montgom'y. 3,586	Scriver..... 9,175	Walton..... 11,038
Glascock .. 2,736	Johnson 2,964	Morgan 10,696	Spaulding.. 10,205	Ware 2,286
Glynn 5,376	Jones 9,436	Murray 6,500	Stewart 14,204	Warren 10,545
Gordon..... 9,268	Laurens ... 7,834	Muscogee.. 16,663	Sumter..... 16,559	Washing'n. 15,641
Greene 12,454	Lee 9,567	Newton 14,615	Talbot..... 11,913	Wayne..... 2,177
Gwinnett .. 12,431	Liberty 18,917	Oglethorpe. 11,782	Taliaferro . 4,296	Webster.... 4,627
Habersham 6,322	Lincoln.... 5,413	Paulding .. 7,639	Tatnall.... 4,860	White 4,606
Hall 9,607	Lowndes .. 8,321	Pickens 5,317	Taylor 7,143	Whitfield ... 10,117
Hancock... 11,317	Lumpkin .. 5,161	Pierce..... 2,778	Telfair 3,245	Wilcox..... 2,439
Haralson... 4,004	Macon 11,458	Pike 10,905	Terrell 9,053	Wilkes 11,726
Harris 13,284	Madison.... 5,227	Polk 7,822	Thomas.... 17,158	Wilkinson . 9,387
Hart 6,783	Marion..... 8,000	Pulaski 11,940	Towns 2,780	Worth 3278
Heard..... 7,866	McIntosh .. 4,485	Putnam 10,461	Total.....	1,194,089

ILLINOIS. Area, 55,405 square miles.

Adams 56,362	Du Page .. 16,685	Jo Daviess. 27,810	Mason..... 16,184	Saline..... 12,714
Alexander . 10,564	Edgar 21,450	Johnson 11,248	Massac..... 9,581	Sangamon . 46,354
Bond..... 13,152	Edwards .. 7,565	Kane..... 39,091	Menard 11,735	Schuyler .. 17,419
Boone..... 12,942	Effingham.. 15,653	Kankee 24,352	Mercer..... 18,769	Scott..... 10,530
Brown 12,205	Fayette 19,338	Kendall 12,399	Monroe 12,892	Shelby 25,475
Bureau.... 32,415	Ford 9,103	Knox 39,523	Montgom'y. 25,315	Stark 10,751
Calhoun 6,562	Franklin .. 12,652	Lake..... 21,014	Morgan 28,463	Stephenson. 30,608
Carroll ... 16,705	Fulton 38,292	La Salle.. 60,792	Moultrie .. 10,385	Tazewell .. 27,903
Cass 10,089	Gallatin .. 11,134	Lawrence.. 12,533	Ogle 27,493	Union 16,518
Champaign 32,738	Green 27,271	Lee 27,171	Peoria..... 42,540	Vermilion . 33,388
Christian .. 20,363	Grundy 14,938	Livingston . 31,472	Perry 13,723	Wabash 8,841
Clark 18,719	Hamilton .. 13,014	Logan..... 23,052	Piatt..... 10,953	Warren 23,174
Clay 15,875	Hancock .. 34,461	McDono'h .. 26,511	Pike 30,768	Washing'n. 17,599
Clinton 16,284	Hardin..... 5,113	McHenry.. 23,762	Pope..... 11,437	Wayne..... 19,758
Coles..... 25,237	Henderson . 12,583	McLean 53,988	Pulaski.... 8,752	White..... 16,846
Cook 349,970	Henry..... 38,917	Macon 20,622	Putnam 66,280	Whiteside . 27,506
Crawford.. 13,889	Iroquois .. 25,782	Macoupin .. 32,729	Randolph .. 20,859	Will 43,013
Cumberl'd . 12,223	Jackson 19,634	Madison.... 44,131	Richland .. 12,803	Williamson 17,329
De Kalb.. 23,265	Jasper 11,234	Marion..... 20,622	Rock Island 29,783	Winnebago 29,301
De Witt .. 14,768	Jefferson .. 17,864	Marshall .. 16,956	St. Clair.. 51,069	Woodford . 18,956
Douglas .. 13,484	Jersey 13,054	Total.....		2,539,638

INDIANA.—Area, 33,809 square miles.

Adams 10,382	Elkhart 26,026	Jefferson .. 29,741	Noble 20,389	Stark 3,888
Allen..... 43,494	Fayette 10,476	Jennings .. 16,218	Ohio 5,837	Steuben 12,854
Barthol'w .. 21,133	Floyd 23,300	Johnson 18,366	Orange..... 13,497	Sullivan 18,453
Benton 5,615	Fountain .. 16,389	Knox 21,559	Owen 16,137	Switzerland 12,134
Blackford .. 6,272	Franklin .. 20,222	Kosciusko . 23,531	Parke..... 18,166	Tippecanoe 33,515
Boone..... 22,503	Fulton 12,726	La Grange. 14,148	Perry 14,801	Tipton 5,153
Brown 8,681	Gibson 17,371	Lake..... 12,339	Pike 13,779	Union 6,341
Carroll 16,152	Grant 18,487	La Porte .. 27,062	Porter 13,942	Vanderb'g . 33,145
Cass 24,193	Green 19,514	Lawrence.. 14,628	Posey 19,185	Vermilion . 10,840
Clarke 24,770	Hamilton .. 20,882	Madison.... 22,770	Pulaski.... 7,802	Vigo 33,549
Clay 19,084	Hancock 15,123	Marion..... 65,245	Putnam 21,514	Wabash 21,305
Clinton.... 17,330	Harrison .. 19,913	Marshall .. 20,211	Randolph .. 22,862	Warren 10,204
Crawford.. 9,851	Hendricks . 20,277	Martin 11,103	Ripley..... 20,977	Warwick ...
Daviess 16,747	Henry..... 22,986	Miami..... 21,052	Rush..... 17,626	Washing'n 18,495
Dearborn.. 24,116	Howard 15,847	Monroe..... 14,168	St. Joseph . 25,322	Wayne..... 34,048
Decatur.....	Huntington 19,036	Montgom'y. 23,765	Scott..... 7,873	Wells 13,585
De Kalb.. 17,167	Jackson 18,974	Morgan 17,528	Shelby 21,892	White..... 10,554
Delaware.. 19,030	Jasper 6,534	Newton 5,829	Spencer 17,998	Whitley 14,399
Dubois 12,597	Jay 15,000			

IOWA.—Area, 50,914 square miles.

Adair 3,982	Cedar 19,731	Dubuque .. 38,969	Humboldt . 2,596	Madison 16,854
Adams 4,614	Cerro Gor'o 4,722	Emmett 1,292	Ida 226	Mahaska 2,508
Allamakee . 17,868	Cherokee 1,967	Fayette 16,973	Iowa 16,642	Marion 4,434
Appanoose . 16,456	Chickasaw. 10,180	Floyd 10,768	Jackson 22,620	Marshall .. 17 076
Audubon .. 1,212	Clarke 8,735	Franklin .. 4,738	Jasper 22,116	Mills 8,717
Benton 22,454	Clay 1,523	Fremont.... 11,174	Jefferson .. 17,839	Mitchell 9,583
Bl'k Hawk. 21,706	Clayton 27,771	Greene 4,627	Johnson 24,898	Monona 3,654
Boone..... 14,576	Clinton 35,357	Grundy 6,398	Jones 19,731	Monroe..... 12,724
Bremer 12,528	Crawford.. 2,530	Guthrie 7,061	Keokuk 19,434	Montgom'y. 5,934
Buchanan . 17,034	Dallas..... 12,019	Hamilton .. 6,065	Kossuth 3,351	Muscatine 21,688
Buena Vista. 1,585	Davis 15,565	Hancock.... 999	Lee 37,210	O'Brien 715
Butler 9,951	Decatur 12,018	Hardin..... 13,686	Lyan 28,785	Osceola ....
Calhoun 1,602	Delaware .. 17,432	Harrison .. 8,931	Louisa..... 12,869	Page..... 9,374
Carroll 2,461	Des Moines 27,258	Henry..... 21,460	Lucas 10,288	Palo Alto .. 1,336
Cass 5,464	Dickinson .. 1,389	Howard 6,282	Lyon..... 21	Plymouth .. 2,199

Pocahontas. 1,446
Polk..... 27,857
Pottawat'e 16,893
Poweshiek .15,581
Ringgold . 5,692
Sac 1,411
Scott..... 33,509
Shelby..... 2,540
Sioux 676
Story 11,651
Tama 16,131
Taylor 6,989
Union 5,596
Van Buren. 17,672
Wapello ... 22,346
Warren ... 17,982
Washingt'n 18,952
Wayne 11,257
Webster ... 10,484
Winnebago 1.562
Winneshiek 23,570
Woodbury . 6,252
Worth 2,892
Wright 2,392
Total. .1,191,802

KANSAS.—Area, 78,418 square miles.

Allen..... 7,023
Anderson .. 5,220
Atchison ... 15,507
Barb'r (w. Carley
Burton 2
Bourbon ... 15,076
Brown 6,824
Butler..... 3,035
Chase 1,975
Cherokee .. 11,038
Clarke ....
Clay..... 2,942
Cloud 2,323
Coffee 6,201
Comanche .. ..
Carley et al 1,175
Davis 3,993
Dickinson.. 3,343
Doniphan.. 13,969
Douglas .. 20,604
Ellis 1,336
Ellsworth.. 1,185
Ford..... .....
Franklin... 10,385
Graham.... 768
Greenwood. 3,484
Gove..... .....
Harp'r (w. Carley
Hodgeman. .....
Howard 2,794
Jackson.... 6,053
Jefferson... 12,526
Lyon..... 8,024
Marion..... 768
Marshall... 6,901
McPherson. 738
Miami 11,725
Mitchell ... 485
Montgom'y. 7,564
Morris 2,225
Nemcha ... 7,339
Ness 2
Neosho 10,206
Norton..... .....
Osage 7,648
Osborne ... 33
Ottawa..... 2,127
Pawnee ... 179
Phillips ... .
Pottawat'e. 7,818
Pratt ....
Reno..... .....
Republic... 1,281
Rice 5
Riley..... 5,105
Rorke..... .....
Rush..... .....
Russell.... 156
Saline..... 4,246
Sedgwick.. 1,522
Shawnee .. 13,121
Smith 66
Stafford ... .
Sumner ....
Trego 166
Wabaunsee 3,362
Wallace ... 538
Washingt'n 4,081
Wilson 6,694
Woodson .. 3,827
Wyandot .. 10,019
Total.... 362,872

KENTUCKY.—Area, 37,680 square miles.

Adair 11,055
Allen..... 10,256
Anderson .. 5,449
Ballard.... 12,576
Barren 17,780
Bath 10,145
Boone..... 10,696
Bourbon... 14,863
Boyd..... 8,573
Boyle 9,515
Bracken ... 11,409
Breathitt .. 5,672
Breckin'ge. 13,440
Bullit 7,781
Butler..... 9,404
Caldwell .. 10,826
Calloway .. 9,400
Campbell .. 27,406
Carroll.... 6,189
Carter..... 5,569
Casey 8,884
Christian .. 23,227
Clark..... 10,882
Clay 8,297
Clinton.... 6,457
Crittenden. 9,381
Cumber'd.. 7,690
Daviess.... 20,714
Edmondson 4,459
Elliott..... 4,433
Estill..... 9,198
Fayette.... 20,648
Fleming ... 13,398
Floyd 7,877
Franklin... 15,300
Fulton 6,161
Gallatin ... 6,074
Garrard ... 10,376
Grant 9,529
Graves 19,398
Grayson ... 11,580
Greene 9,379
Grimp 10,947
Hancock... 6,591
Hardin 15,705
Harlan 4,415
Harrison .. 12,993
Hart 13,687
Henderson. 18,457
Henry..... 11,066
Hickman .. 8,453
Hopkins ... 13,827
Jackson.... 4,547
Jefferson .118,953
Jessamine . 8,638
John Bell .. 3,731
Johnson ... 7,494
Kenton 36,096
Knox..... 8,294
La Rue.... 8,235
Laurel..... 6,016
Lawrence . 8,497
Lee 3,055
Letcher.... 4,608
Lewis 9,115
Lincoln ... 10,947
Livingston . 8,200
Logan 20,429
Lyon..... 6,233
Madison ... 19,543
Magoffin... 4,684
Marion..... 12,838
Marshall .. 9,955
Mason..... 18,126
McCracken 13,988
McLean 7,614
Meade 9,485
Menifee ... 1,986
Mercer..... 13,144
Metcalf.... 7,934
Monroe..... 9,231
Montgom'y. 7,557
Morgan.... 8,978
Muhlenb'g. 12,628
Nelson 14,804
Nicholas... 9,129
Ohio 15,561
Oldham 9,027
Owen 14,309
Owsley 3,889
Pendleton .14,030
Perry 4,274
Pike..... 9,562
Powell 2,599
Pulaski.... 17,676
Robertson .. 3,099
Rock Castle 7,145
Rowan 2,991
Russell.... 5,800
Scott..... 11,607
Shelby 15,723
Simpson ... 9,573
Spencer ... 5,956
Taylor 8,226
Todd..... 12,612
Trigg 13,686
Trimble ... 5,677
Union 13,640
Warren ... 21,742
Washing'n. 12,464
Wayne..... 10,602
Webster ... 10,937
Whitley ... 8,278
Wolfe 3,603
Woodford . 8,240
Total.....1,321,001

LOUISIANA.—Area, 41,255 square miles.

Ascension... 11,577
Assumption 13,234
Avoyelles .. 12,926
B. Roug. E. 17,817
B.Roug.W 5,114
Bienville .. 10,636
Bossier.... 12,675
Caddo..... 21,714
Calcasieu.. 6,733
Caldwell... 4,820
Cameron .. 1,591
Carroll..... 10,110
Catahoula . 8,475
Claiborne.. 20,240
Concordia . 9,977
De Soto ... 14,262
Felici'na, E 13,499
Felici'na, W 10,498
Franklin .. 5,078
Grant 4,517
Iberia 9,042
Iberville... 12,347
Jackson.... 7,646
Jefferson .. 17,767
Lafayette.. 10,388
Lafourche .14,719
Livingston . 4,026
Madison.... .....
Morehouse 9,387
Natchitoch' 18,265
Opelousas .. ..
Orleans ... 191,425
Ouachita .. 11,552
Pla'quemine 10,553
Pt. Coupee. 12,981
Rapides ... 18,015
Richland .. 5,110
Sabine 6,456
S. Bernard. 3,553
St. Charles. 4,867
St. Helena. 5,423
St. James.. 10,153
S.J. the B'p .....
S. Laund'y. 24,646
S. Martin's. 9,370
St. Mary's. 13,860
St. Tamm'y 5,586
Tangipaho. 7,928
Tensas 12,421
Ter.Bonne. 12,451
Union 11,685
Vermilion.. 4,528
Washing'n. 3,330
Winn 4,955
Total.....732,731

MAINE.—Area, 31,766 square miles.

Androsc'n .35,885
Aroostook .29,609
Cumberl'd. 82,020
Franklin .. 18,807
Hancock... 36,470
Kennebec.. 53,205
Knox 30,822
Lincoln.... 25,597
Oxford 33,488
Penobscot .74,691
Piscataquis 14,603
Sagadahoc. 18,803
Somerset .. 34,611
Waldo 34,535
Washing'n. 43,343
York..... 60,174
Total.....626,463

MARYLAND.—Area, 11,124 square miles.

Alleghany .38,536
A. Arundel. 24,457
Baltimore. 330,741
Calvert.... 9,865
Caroline... 12,101
Carroll.... 28,619
Cecil..... 25,874
Charles.... 15,738
Dorchester. 19,458
Frederick . 47,572
Harford ... 22,605
Howard 14,150
Kent 17,102
Montgom'y. 20,563
Pr. George. 21,138
Qu'n Anne. 16,083
St. Mary's 14,944
Somerset .. 18,190
Talbot..... 16,137
Washing'n. 34,712
Wicomico . 15,802
Worcester. 16,419
Total.....780,806

MASSACHUSETTS.—Area, 7,800 square miles.

Barnstable. 32,774
Berkshire . 64,827
Bristol ... 102,886
Dukes..... 3,787
Essex 200,843
Franklin .. 32,635
Hampden... 78,409
Hampshire. 44,398
Middlesex. 274,353
Nantucket. 4,123
Norfolk ... 80,443
Plymouth .. 65,365
Suffolk ... 270,802
Worcester 192,716
Total .. 1,457,351

MICHIGAN.—Area, 56,243 square miles.

Alcona	606	Crawford		Kalamazoo	32,054	Menominee	1,892
Allegan	32,105	Delta	2,441	Kalcosco	424	Michil'nac	
Alpena	2,756	Eaton	25,171	Kent	50,403	Midland	3,285
Antrim	1,985	Emmet	1,211	Keweenaw	4,205	Missaukee	130
Barry	22,199	Genesee	33,900	Lake	548	Monroe	27,483
Bay	15,900	Gladwin		Lapeer	21,345	Montcalm	13,629
Benzie	2,184	Gd Trave's	3,443	Leelenaw	4,816	Montmor'y	
Berrien	35,104	Gratiot	11,810	Lenawee	45,596	Muskegon	14,894
Branch	26,226	Hillsdale	31,684	Livingston	19,336	Newaygo	7,208
Calhoun	36,569	Houghton	13,879	Mackinaw	1,716	Nicosta	
Cass	21,694	Huron	9,049	Macomb	27,616	Oakland	40,867
Charlevoix	1,794	Ingham	25,259	Manitou	891	Oceana	7,222
Cheboygan	2,186	Ionia	27,681	Manistee	6,074	Ogemaw	12
Chippewa	1,689	Iosco	3,163	Marquette	15,033	Ontonagon	2,845
Clare	366	Isabell	4,113	Mason	3,273	Osceola	2,093
Clinton	22,845	Jackson	36,047	Mecosta	5,642	Oscoda	70
						Total	1,184,296

MINESOTA.—Area, 95,274 square miles.

Aitken	18	Cottonwood	534	Kennebec	93	Otter Tail	
Anoka	3,940	Crow Wing	200	Lake	135	Pembina	64
Becker	308	Dakota		L. qui Parl.	145	Pierce	
Bellraine	80	Dodge	8,598	Le Sueur	11,607	Pine	648
Benton	1,558	Douglas et al	4579	McLeod	51,643	Pipe Stone	
Big Stone	24	Faribault	9,390	Manomin		Polk	
Blue Earth	17,302	Fillmore	24,887	Martin	13,867	Pope et al	2,878
Breckin'e	1	Freeborn	16,683	Meeker	6,096	Ramsey	23,081
Brown	6,369	Goodhue	22,618	Mille Lac	1,109	Redwood	1,829
Buchanan		Grant		Monongalia	3,161	Renville	
Carlton	286	Hennepin	31,566	Morrison	1,899	Rice	16,783
Carver	11,587	Houston	11,661	Mower	10,447	Rock	2,138
Cass	184	Isanti		Murray	209	St. Louis	11,561
Chippewa	1,417	Itasca	178	Nicollet	8362	Scott	11,042
Chisago	4,358	Jackson	1,825	Noble	117	Sherburne	2,050
Clay	92	Kandiyohi	1,760	Olmsted	19,793	Total	

Sibley	6,725						
Stearns	14,206						
Steele	8,271						
Stevens							
Todd							
Toombs							
Traverse							
Wabashaw	15,859						
Wadina	6						
Waseca	7,854						
Washing'n	11,810						
Watonwan	2,426						
Wilkin	295						
Winona	22,318						
Wright	9,457						
	435,511						

MISSISSIPPI.—Area, 47,156 square miles.

Adams	14,774	Covington	4,753	Jefferson	13,848	Monroe	22,632
Alcorn	10,431	De Soto		Jones	3,313	Neshoba	
Amite		Franklin	7,469	Kemper		Newton	9,807
Attala		Greene	2,038	Lafayette		Noxubee	20,905
Bolivar	9,732	Grenada	10,571	Lauderdale	13,462	Oktibbeha	
Calhoun	10,561	Hancock	4,239	Lawrence	6,720	Panola	12,412
Carroll	21,047	Harrison	5,795	Leake		Perry	2,694
Chickasaw	19,899	Hinds	26,798	Lee	15,955	Pike	11,303
Choctaw		Holmes	19,320	Lincoln	10,184	Pontotoc	
Claiborne	13,386	Issaquena	6,887	Lowndes	30,502	Prentiss	9,347
Clark	7,505	Itawamba	7,812	Madison	20,948	Rankin	12,977
Coshoma	7,144	Jackson	4,362	Marion	4,211	Scott	7,848
Copiah	20,608	Jasper	10,884	Marshall	29,416	Simpson	5,718
			Total				

Sumflower							
Talliafa'e	7,852						
Tippah	20,727						
Tishemingo							
Tunica	5,358						
Warren	26,765						
Washing'n	14,569						
Wayne	4,206						
Wilkinson							
Winston	8,984						
Yalabusha	13,254						
Yazoo							
	627,117						

MISSOURI.—Area, 67,380 square miles.

Adair	11,449	Clay	15,564	Iron	6,278	Montgom'y	10,405
Andrew	15,137	Clinton	14,063	Jackson	55,041	Morgan	8,434
Atchison	8,440	Cole	10,292	Jasper	14,929	N. Madrid	11,339
Audrain	12,307	Cooper	20,692	Jefferson	15,380	Newton	12,821
Barry	10,373	Crawford	7,582	Johnson	24,649	Nodaway	14,751
Barton	5,087	Dade	8,683	Knox	10,274	Oregon	3,287
Bates	15,960	Dallas	8,383	Laclede	9,380	Osage	10,793
Benton	11,322	Daviess	14,410	Lafayette	22,623	Ozark	3,363
Bollinger	8,162	De Kalb	9,458	Lawrence	13,067	Pemiscot	2,059
Boone	20,765	Dent	6,357	Lewis	15,114	Perry	9,827
Buchanan	30,350	Douglas	3,915	Lincoln	14,073	Pettis	18,706
Butler	4,298	Dunklin	5,582	Linn	15,900	Phelps	10,506
Caldwell	11,390	Franklin	30,098	Livingston	16,041	Pike	23,076
Callaway	19,202	Gasconade	10,093	Macon	23,230	Platte	17,330
Camden	6,108	Gentry	11,607	Madison	5,849	Polk	12,445
C. Girard'u	17,558	Green	21,549	Maries	5,915	Pulaski	4,714
Carroll	17,445	Grundy	10,567	Marion	22,504	Putnam	11,217
Cass	19,296	Harrison	14,635	McDonald	5,226	Ralls	10,510
Carter	1,455	Henry	17,401	Mercer	11,557	Randolph	15,908
Cedar	9,474	Hickory	6,452	Miller	6,616	Ray	18,700
Chariton	19,135	Holt	11,652	Mississippi		Reynolds	3,756
Christian	6,707	Howard	17,233	Moniteau	11,335	Ripley	3,175
Clark	13,667	Howell	4,218	Monroe	17,149	St. Charles	21,304

St. Clair	6,742						
St. Francois	9,741						
St. Gen'v'e	8,384						
St. Louis	351,189						
Saline	21,672						
Schuyler	7,987						
Scotland	10,676						
Scott	7,317						
Shannon	2,339						
Shelby	10,119						
Stoddard	8,535						
Stone	3,253						
Sullivan	11,908						
Taney	4,407						
Texas	9,618						
Vernon	11,246						
Warren	8,673						
Washing'n	11,719						
Wayne	6,068						
Webster	10,434						
Worth	5,004						
Wright	5,684						
Total	1,711,796						

NEBRASKA.—Area, 75,995 square miles.

Adams	19	Blk Bird	31	Buffalo	193	Burt	2,847

Butler	1,256

Calhoun	.....	Ft. Randall	.....	Kearney	58	Pierce	103	Wayne	9
Cass	8,151	Franklin	26	Lancaster	7,074	Platte	1,899	Webster	16
Cedar	1,032	Gage	473	L'E.q.Cou't	261	Polk	136	York	604
Cheyenne	190	Grant	484	Lincoln	17	Richardson	9,780	Pawnee I.R.	44
Clay	54	Green	.....	Lyon	78	Saline	3,106	Winnebago	34
Colfax	1,424	Hall	1,057	Madison	1,133	Sarpy	2,913	Territ'y (un-	
Cuming	12,345	Hamilton	130	Merrick	557	Saunders	4,547	organized	
Dakota	2,040	Harrison	631	Monroe	235	Seward	2,993	into coun-	
Dawson	103	Jackson	9	Nemaha	7,593	Shorter	.....	ties) in the	
Dixon	1,345	Jefferson	2,446	Nucolls	8	Stanton	1,637	N.W. por-	
Dodge	4,212	Johnson	3,429	Otoe	12,345	Taylor	197	tion of the	
Douglas	19,982	Jones	.....	Pawnee	2,637	Washingt'n	4,452	State	2
Fillmore	238								

NEVADA.—Area, 112,090 square miles.

Carson	.....	Esmeralda	1,553	Lyon	1,837	Pah Ute	762	St. Mary's	.....
Churchill	196	Humboldt	1,916	Nye	1,087	Roop	133	Washoe	3,091
Douglas	1,215	Lander	2,815	Ormsby	3,668	Storey	11,359	White Pine	7,189
Elko	3,447	Lincoln	2,223	Total					42,491

NEW-HAMPSHIRE.—Area, 9,280 square miles.

Belknap	17,681	Cheshire	27,265	Grafton	39,103	Merrimack	42,151	Strafford	30,242
Carroll	17,332	Coos	14,932	Hillsboro	64,238	Rockingh'm	47,298	Sullivan	18,058
		Total							318,300

NEW-JERSEY Area, 3,320 square miles.

Atlantic	14,093	Cumberl'd	34,665	Hunterdon	36,963	Morris	43,137	Somerset	23,510
Bergen	30,142	Essex	143,845	Mercer	46,386	Ocean	13,630	Sussex	23,168
Burlington	53,638	Gloucester	21,562	Middlesex	.....	Passaic	46,416	Union	41,865
Camden	46,038	Hudson	129,068	Monmouth	46,196	Salem	23,940	Warren	34,348
Cape May	8,349	Total							905,794

NEW-YORK.—Area, 47,000 square miles.

Albany	133,052	Dutchess	74,404	Livingston	38,310	Otsego	48,969	Steuben	67,717
Allegany	40,814	Erie	178,695	Madison	43,522	Putnam	15,420	Suffolk	46,960
Broome	44,107	Essex	29,042	Monroe	117,867	Queens	73,804	Sullivan	34,546
Cataraugus	43,909	Franklin	30,271	Montgom'y	34,457	Rensselaer	95,550	Tioga	30,573
Cayuga	59,549	Fulton	27,064	New York	922,531	Richmond	33,029	Tompkins	33,180
Chatauqua	59,328	Genesee	31,608	Niagara	50,430	Rockland	25,213	Ulster	84,075
Chemung	35,281	Greene	31,832	Oneida	110,009	S.Lawrence	84,825	Warren	22,591
Chenango	40,583	Hamilton	2,960	Onondaga	104,144	Saratoga	51,529	Washingt'n	49,570
Clinton	48,028	Herkimer	39,932	Ontario	45,108	Schenecta'y	21,347	Wayne	47,711
Columbia	47,044	Jefferson	65,415	Orange	80,901	Schoharie	33,340	Westche'r	132,228
Cortland	25,174	Kings	419,926	Orleans	27,689	Schuyler	18,889	Wyoming	29,162
Delaware	42,973	Lewis	28,700	Oswego	77,942	Seneca	27,826	Yates	19,595
		Total							4,364,411

NORTH-CAROLINA.—Area, 50,704 square miles.

Alamance	11,874	Chowan	6,450	Guilford	21,736	Mecklen'g	24,299	Rowan	16,811
Alexander	6,868	Clay	2,463	Halifax	20,407	Mitchell	4,705	Rutherford	13,121
Alleghany	3,697	Cleveland	12,696	Harnett	8,895	Montgom'y	7,487	Sampson	16,436
Anson	12,428	Columbus	8,474	Haywood	7,921	Moore	12,040	Stanly	8,315
Ashe	9,573	Craven	20,516	Henderson	7,706	Nash	11,077	Stokes	11,208
Beaufort	13,054	Cumberl'd	17,035	Hertford	9,273	N.Hanover	27,978	Surry	11,252
Bertie	12,950	Currituck	5,131	Hyde	6,445	Northam'n	14,749	Transylv'a	3,536
Bladen	12,831	Dane	2,728	Iredell	16,931	Onslow	7,569	Tyrrel	4,173
Brunswick	7,754	Davidson	17,256	Jackson	6,683	Orange	17,507	Union	12,218
Buncombe	15,412	Davie	9,620	Johnson	14,158	Pasquotank	8,131	Wake	35,617
Burke	9,777	Duplin	15,542	Jones	5,002	Perquim's	7,945	Warren	17,768
Cabarras	11,954	Edgecombe	22,970	Lenoir	10,434	Person	11,170	Washing'n	6,516
Caldwell	8,476	Forsyth	13,050	Lillington	.....	Pitt	17,276	Watauga	5,287
Camden	5,361	Franklin	14,134	Lincoln	9,573	Polk	4,319	Wayne	18,144
Carteret	9,510	Gaston	12,602	Macon	6,615	Randolph	17,555	Wilkes	15,539
Caswell	16,081	Gates	7,724	Madison	8,192	Richmond	12,882	Wilson	12,258
Catawba	10,984	Granville	24,831	Martin	9,647	Robeson	13,251	Yadkin	10,697
Chatham	19,723	Greene	8,687	McDowell	7,592	Rockingh'm	15,710	Yancey	5,909
Cherokee	8,080	Total							1,065,505

OHIO.—Area, 39,964 square miles.

Adams	20,750	Clermont	34,296	Franklin	63,019	Hocking	17,925	Madison	15,633
Allen	23,623	Clinton	21,915	Fulton	17,789	Holmes	18,178	Mahoning	31,001
Ashland	21,933	Columbi'na	38,299	Gallia	25,545	Huron	28,532	Marion	16,184
Ashtabula	32,518	Coshocton	23,600	Geauga	13,069	Jackson	21,759	Medina	20,092
Athens	21,872	Crawford	25,556	Greene	28,052	Jefferson	29,188	Meigs	31,465
Auglaize	20,040	Cuyahoga	132,012	Guernsey	23,798	Knox	26,333	Mercer	17,254
Belmont	39,715	Darke	32,131	Hamilton	260,370	Lake	15,935	Miami	32,740
Brown	30,802	Defiance	15,719	Hancock	23,847	Lawrence	31,380	Monroe	25,780
Butler	39,912	Delaware	25,175	Hardin	18,714	Licking	36,122	Montgom'y	63,897
Carroll	14,491	Erie	28,188	Harrison	18,682	Logan	23,028	Morgan	20,363
Champaign	24,188	Fairfield	31,139	Henry	14,028	Loraine	30,308	Morrow	18,583
Clark	32,070	Fayette	17,170	Highland	29,103	Lucas	46,783	Muskingum	44,887

Noble 19,949	Portage 24,577	Scioto 29,302	Tuscarawa's 33,840	Washing'n 40,609	
Ottawa 13,255	Preble 21,809	Seneca 30,828	Union 18,730	Wayne 35,082	
Paulding 8,544	Putnam 17,083	Shelby 20,748	Van Wert .. 15,824	Williams .. 20,991	
Perry 18,453	Richland .. 32,516	Stark 52,508	Vinton 15,027	Wood 24,596	
Pickaway .. 24,875	Ross 37,097	Summit 34,674	Warren 26,690	Wyandotte. 18,554	
Pike 15,441	Sandusky .. 25,504	Trumbull .. 38,659	Total		2,662,214

OREGON.—Area, 102,606 square miles.

Baker 2,804	Columbia.. 863	Josephine.. 1,204	Polk 4,700	Union 2,552	
Benton.... 4,584	Curry 504	Lane.... 6,426	Tillamook .. 408	Wasco 2,509	
Coos 1,644	Douglas .. 6,066	Linn 8,717	Umpqua	Washing'n. 4,261	
Clackamas. 5,993	Grant 2,251	Marion 9,066	Umatilla .. 2,916	Yam Hill.. 5,012	
Clatsop.... 1,254	Jackson 4,778	Multnomah 11,510	Total		90,922

PENNSYLVANIA.—Area, 46,000 square miles.

Adams 30,315	Chester.... 77,806	Franklin .. 45,365	McKean.... 8,825	Snyder 15,607	
Allegheny. 262,373	Clarion.... 26,960	Fulton 9,360	Mercer.... 49,979	Somerset .. 28,228	
Armstrong. 43,382	Clearfield.. 25,740	Greene 25,887	Mifflin 17,508	Sullivan 6,191	
Beaver 36,150	Clinton.... 23,211	Huntington 30,995	Monroe.... 18,362	Susquch'na 37,524	
Bedford 29,635	Columbia.. 29,766	Indiana 36,139	Montgom'y 81,772	Tioga 35,100	
Berks 106,739	Crawford.. 63,794	Jefferson .. 21,656	Montour.... 15,324	Union 15,565	
Blair 38,051	Cumberl'd. 43,912	Juniata.... 17,390	Northam'n. 61,433	Venango.... 47,935	
Bradford .. 53,204	Dauphin.. 60,736	Lancaster. 121,340	Northum'd. 41,449	Warren 23,897	
Bucks 64,345	Delaware.. 39,403	Lawrence.. 27,298	Perry 25,486	Washing'n. 48,483	
Butler 36,510	Elk 5,488	Lebanon.... 34,096	Philadel'a. 674,022	Wayne.... 33,118	
Cambria.... 36,569	Erie 65,972	Lehigh 56,798	Pike 8,436	Westmor'd. 58,720	
Cameron .. 4,273	Fayette 43,284	Luzerne.... 160,737	Potter 11,265	Wyoming .. 14,585	
Carbon.... 28,144	Forest.... 4,010	Lycoming .. 47,629	Schuylkill. 109,869	York 76,216	
Centre 34,404	Total				3,499,248

RHODE ISLAND.—Area, 1,306 square miles.

Bristol 9,421	Kent.... 18,595	Newport .. 20,050	Providen'c 149,193	Washing'n 20,097	
Total					217,356

SOUTH-CAROLINA.—Area, 29,385 square miles.

Abbeville.. 31,129	Clarendon.	Greenville .. 20,015	Marion....	Richland .. 13,727	
Anderson .. 21,049	Colleton 34,014	Horry 10,721	Marlboro .. 11,814	Spartanb'g. 25,784	
Barnwell .. 36,844	Columbia.. 9,298	Kershaw .. 11,754	Newberry .. 17,983	Sumter.... 25,268	
Beaufort .. 40,511	Darlington. 22,391	Lancaster . 12,087	Oconee 10,536	Union 19,248	
Charleston.	Edgefield .. 42,486	Laurens .. 22,536	Orangeb'g.	Williams'g. 15,489	
Chester.... 18,805	Fairfield	Lexington.	Pickens.... 10,269	York 22,448	
Chesterfi'd.	Georgetown 16,161				

TENNESSEE.—Area, 45,600 square miles.

Anderson .. 8,704	De Kalb.. 11,425	Henderson. 14,219	Marion 6,866	Sequatchie. 2,335	
Bedford 24,334	Dickson 9,940	Henry 20,382	Marshall.. 16,207	Sevier 11,028	
Benton 8,234	Dyer 13,706	Hickman .. 9,856	Maury 36,286	Shelby 76,378	
Blount.... 14,237	Fentress.... 4,717	Humphrey.. 9,326	Meigs 4,511	Smith 15,994	
Bradley 11,652	Franklin .. 14,370	Jackson 12,586	Monroe.... 12,589	Stewart 12,019	
Campbell.. 7,445	Gibson 25,679	Jefferson .. 19,476	Montgom'y. 24,708	Sullivan 13,136	
Cannon.... 10,502	Giles 32,413	Johnson 5,852	Morgan 2,960	Sumner 23,711	
Carroll 19,447	Grainger .. 12,461	Knox 28,994	Obion 15,668	Tipton 14,884	
Carter 7,909	Greene 21,668	Lake 2,428	Overton 10,949	Van Buren.. 2,725	
Cheatham . 6,678	Grundy 3,251	Lawrence.. 7,600	Polk 7,369	Warren 12,715	
Claiborne.. 9,321	Hamilton .. 17,341	Lewis 1,986	Putnam 8,698	Washing'n. 16,318	
Cocke 12,458	Hancock.... 7,148	Lincoln.... 28,051	Rhea.... 4,854	Wayne.... 10,209	
Coffee 10,237	Hardeman.. 17,767	McMinn 13,969	Roane 15,623	Weakly 20,755	
Cumberl'd.. 3,461	Hardin 11,770	McNairy .. 12,726	Robertson. 16,166	White.... 9,228	
Davidson .. 63,898	Hawkins 15,848	Macon 6,633	Rutherford. 33,289	Williamson 25,352	
Decatur 7,776	Haywood .. 25,095	Madison .. 23,550	Scott 4,054	Wilson 25,884	
Total					1,257,983

TEXAS.—Area, 237,504 square miles.

Anderson....	Brown	Concho....	Fannin....	Haskell	
Angeline	Buchanan	Cook....	Fayette	Hays.... 4,088	
Arecher....	Burleson	Coryell....	Fort Bend . 7,114	Henderson	
Atacosa	Burnett....	Dallas	Freestone	Hidalgo 2,387	
Austin 15,087	Caldwell	Davis	Frio	Hill 7,453	
Bandera 649	Calhoun....	Dawson	Galveston.. 15,290	Hood....	
Bastrop	Cameron .. 10,999	Denton....	Gillespie	Hopkins....	
Baylor....	Cass	De Witt.... 6,443	Goliad 3,628	Houston....	
Bee	Chambers .. 1,503	Dinumit 866	Gonzales	Hunt	
Bell 1,082	Cherokee....	Duval....	Grayson	Jack 694	
Bexar	Clay	Eastland	Grimes....	Jackson 2,278	
Bexar Dis.	Coleman	Edwards	Guadalupe.	Jasper 4,218	
Blanco....	Callahan	Ellis 7,514	Hamilton..	Jefferson .. 1,906	
Bowie	Collin	El Paso	Hardeman..	Johnson	
Bosque	Colorado .. 8,326	Ensinal	Hardin.... 1,460	Jones	
Brazoria .. 7,563	Comal 5,283	Erath	Harris 17,375	Karnes	
Brazos....	Comanche....	Falls....	Harrison....	Kaufman	

Kendall ... 1,536
Kerr 1,042
Kimball ... 72
Kinney ....
Knox .....
Lamar .....
Lampasas . 1,344
Lasalle ... 69
Lavacca ... 9,168
Leon .....
Liberty ... 4,413
Limestone .....
Live Oak .. 852
Llano 1,379
Madison ...
Marion .....
Mason .....
Matagorda. .....
Maverick.. .....
McCulloch. .....
McLennan. .....
McMullen . 230
Medina.... 2,078
Menora.... 667
Milan ....
Montague . 890
Montmor'y. 6,483
Nacogdoc's .....
Navarro... 8,879
Newton... 2,187
Nueces.... 4,193
Orange.... 1,255
Palo Pinto. .....
Panola..... .....
Parker..... .....
Polk 8,707
Presidio... .....
Red River. .....
Refugio ... 2,324
Robertson .....
Runnells .. ..
Rusk..... .....
Sabine..... .....
S. August'e .....
S. Patricio. 602
San Saba.. .....
Shackleford .....
Shelby ....
Smith..... .....
Starr ....
Stevens ....
Tarrant ... 5,788
Taylor ....
Throckm'n .....
Titus..... .....
Travis ....
Trinity ... .
Tyler 5,010
Upshur ....
Uvalde.... .....
Van Zandt. .....
Victoria .....
Walker.... 9,776
Washing'n. .....
Webb ....
Wharton .. 3,426
Wichita.. .....
Wilbarger. .....
Williamson .....
Wilson.... .....
Wise..... 1,450
Wood..... .....
Young ....
Y'g Ter'y. .....
Zapata 1,488
Zavalla ....

VERMONT.—Area, 10,212 square miles.

Addison ... 23,484
Bennington 21,325
Caledonia . .....
Chittenden. 36,480
Essex ....
Franklin .. ..
Grand Isle. 4,082
Lamoille.. 12,448
Orange.... .....
Orleans ... 21,035
Rutland.... .....
Washingt'n .....
Windham . .....
Windsor ... .

VIRGINIA —Area, 38,352 square miles.

Accomack . 20,409
Albemarle . 27,544
Alexandria. 16,755
Alleghany . 3,674
Amelia 9,878
Amherst... 14,900
Appomattox 8,950
Augusta... 28,763
Barbour ... .
Bath 3,795
Bedford ... 25,327
Berkeley.. .....
Boone..... .....
Bland 4,000
Botetourt.. 11,329
Braxton ... .
Brooke..... .....
Brunswick. 13,427
Buchanan . 3,727
Bucking'm. 13,371
Cabell..... .....
Calhoun ... .
Campbell.. 28,384
Caroline .. 15,128
Carroll 9,147
Clay ....
Charles C'y 4,975
Charlotte .. 11,513
Chesterfield 18,470
Clarke..... 6,670
Craig 2,042
Culpeper .. 12,227
Cumberl'd.. 8,142
Dinwiddie . 30,702
Doddridge.. .....
Elizab'h Cy 8,303
Essex 9,927
Fairfax ... 12,952
Fauquier .. 19,690
Fayette ... .
Floyd 9,824
Fluvanna.. 8,975
Franklin .. 18,264
Frederick . 16,596
Gilmer..... .....
Giles..... 5,659
Gloucester. 10,211
Goochland . 10,313
Grayson ... 9,587
Greenbrier .....
Greenville . 6,362
Greene 4,634
Halifax ....
Hampshire .....
Hancock... .....
Hardy..... 5,518
Harrison .. 17,599
Henrico ... 66,179
Henry 12,303
Highland .. 4,151
Isle of Wig't 8,320
Jackson ... .
James City. 4,425
Jefferson... .....
Kanawha .. ..
K'g George .....
K'g & Q'n. 9,709
K'g Will'm 7,398
Lancaster . 5,355
Lee 13,268
Lewis ....
Logan ....
Loudon.... 20,929
Louisa 16,332
Lunenberg. 10,403
Madison ... .
Marshall... .....
Marion..... .....
Mason ....
Mathews .. 6,200
McDowell . 1,300
Mecklenb'g 21,318
Mercer..... .....
Middlesex . 4,781
Montgom'y. 12,556
Monongalia .....
Monroe..... .....
Morgan ....
Nansemond 11,576
Nelson 13,878
New Kent . 4,381
Nicholas .. ..
Norfolk.... 46,102
Northam'n. 8,046
Northum'd. 6,863
Nottoway.. 9,291
Ohio ....
Orange.... 10,396
Page..... 8,462
Patrick.... 10,161
Pendleton .....
Pittsylva'a. 31,343
Pleasants.. .....
Pocahontas. .....
Powhatan . 7,667
Preston..... .....
Pr. Edw'd. 12,004
Pr. George .....
Pr. Will'm. 7,504
Pr. Anne .. 8,273
Pulaski .. 6,538
Putnam..... .....
Raleigh ....
Randolph .....
Rappah'k. 9,261
Richmond . 6,503
Rockingh'm23,668
Ritchie..... .....
Roane..... .....
Total ...1,224,830

WEST-VIRGINIA.—Area, 23,000 square miles.

Barbour... 12,958
Berkeley .. 14,900
Boone..... 4,503
Braxton... 6,841
Brooke.... 5,464
Cabell..... 6,429
Calhoun ... 2,939
Clay 2,196
Doddridge . 7,076
Fayette.... 6,647
Gilmore ... 4,338
Grant 4,468
Greenbrier. 15,211
Hampshire. 7,643
Hancock... 4,363
Hardy..... 5,518
Harrison .. 17,599
Jackson ... 10,300
Jefferson .. 13,220
Kanawha .. 22,350
Lewis 10,176
Lincoln ... 5,053
Logan 3,458
Marion..... 12,107
Marshall... 14,941
Mason 15,978
Mercer..... 7,064
Mineral ... 6,349
Monongalia 13,547
Monroe..... 11,124
Morgan 4,315
Nicholas... 4,458
Ohio 28,831
Pendleton . 6,455
Pleasants .. 3,012
Pocahontas. 4,070
Preston ... 14,554
Putnam 7,794
Raleigh 3,673
Randolph .. 5,563
Ritchie.... 9,055
Roane..... 7,232
Total..... .....

WISCONSIN.—Area, 53,924 square miles.

Adams 6,601
Ashland ... 221
Bad Ax .....
Barron.... 538
Bayfield .. 344
Brown 25,166
Buffalo... 11,123
Burnett ... 706
Calumet... 12,334
Chippewa.. 8,345
Clark 3,450
Columbia.. 28,813
Crawford.. 13,076
Dallas .....
Dane..... 53,096
Dodge..... 47,039
Door 4,922
Douglas ... 1,122
Dunn 9,489
Eau Claire. 10,770
Fond d' Lac 46,272
Grant 37,978
Green 23,611
Green Lake 13,195
Iowa 24,544
Jackson ... 7,696
Jefferson .. 34,042
Juneau 12,372
Kenosha... 13,147
Kewaunee . 10,128
La Crosse. 20,288
La Fayette. 22,659
La Pointe . .....
Manitowoc. 33,364
Marathon.. 5,883
Marquette . 8,056
Milwaukee. 89,941
Monroe.... 16,551
Oconto 8,321
Outagamie. 18,430
Ozaukee... 15,568
Pepin..... 4,661
Pierce..... 9,959
Polk 3,422
Portage ... 10,636
Racine 25,740
Richland .. 15,732
Rock..... 39,034
St. Croix .. 11,035
Sauk 23,860
Shawanaw. 3,166
Sheboygan . 31,749
Trempeleau 10,733
Vernon.... 18,645
Walworth . 25,971

Washing'n	24,320	Waupaca	15,540	Waushara	11,279	Winnebago	37,280
Wauk'sha	28,282					Wood	3,912
		Total					1,055,167

DISTRICT OF COLUMBIA.—Area, 60 square miles.

Georgetown	11,385	Washin'n	109,204	Bal. Dist	11,117	Total	131,706

TERRITORIES.

ARIZONA.—Area, 113,916 square miles.

Mohave	179	Pima	5,716	Yavapai	2,142	Yuma	1,621
						Total	9,658

COLORADO.—Area, 104,500 square miles.

Arapahoe	6,629	Costilla	1,779	Gilpin	5,490	Lake	522
Bent	592	Douglas	1,388	Greenwood	510	Larimer	838
Boulder	1,939	El Paso	987	Huerfano	2,250	Las Animas	4,276
Clear Creek	1,596	Fremont	1,064	Jefferson	2,390	Park	447
Conejos	2,504						
		Total					39,706

Puebla	2,265						
Sagnache	304						
Summit	258						
Weld	1,478						

DAKOTA.—Area, 50,932 square miles.

Bon Homme	608	Clay	2,621	Lincoln	712	Todd	337
Brookings	163	Deuel	37	Minnehaha	355	Union	3,507
Buffalo	246	Hutchinson	37	Pembina	1,213	Yankton	2,097
Chas. Mix	152	Jayne	5				
		Total					14,181

Unorganized portion of Territ'y. 2,091

IDAHO.—Area. 86,294 square miles.

Ada	2,675	Boise	3,833	Lemhi	988	Oneida	1,922
Alturas	683	Idaho	849	Nez Perces	1,607	Owyhee	1,713
						Total	14,998

Shoshone 722

MONTANA.—Area, 143,776 square miles.

Beaver H'd	722	Dawson	177	Gallatin	1,579	Lewis & Cl'k	5,041
Big Horn	38	Deer Lodge	4,364	Jefferson	1,531	Madison	2,684
Chouteau	517	Total					20,594

Meagher 1,387
Missoula 2,554

NEW-MEXICO.—Area, 121,201 square miles.

Arizona		Dona Ana	5,864	Mora	8,056	Santa Fe	9,699
Bernalillo	7,569	Grant	1,143	Rio Arriba	9,294	San Miguel	16,058
Colfax	1,992	Lincoln	1,740	Santa Ana	2,599	Socorro	6,603
						Total	91,789

Taos 12,079
Valencia 9,093

UTAH.—Area, 84,476 square miles.

Beaver	2,007	G't S't Lake	18,331	Millard	2,753	Sampete	6,786
Box Elder	4,812	Green Riv'r		Morgan	1,972	Shambip	
Cache	8,272	Iron	2,359	Piute		Senir	19
Cedar		Juab	2,035	Rich	1,955	Summit	2,512
Davis	4,459	Kane	1,513	Rio Virgin	459	Tooele	2,177
						Total	86,786

Utah 12,203
Wasatch 1,244
Washing'n 3,064
Weber 7,858

WASHINGTON.—Area, 69,994 square miles.

Chehalis	401	Jefferson	1,268	Mason	289	Suwamish	599
Clallam	408	King	2,120	Pacific	738	Stevens	734
Clarke	3,081	Kitsap	866	Pierce	1,409	Thurston	2,246
Cowlitz	730	Klikitat	329	Spokane		Wahkiak'm	270
Island	626	Lewis	888	Skamania	133		
						Total	23,901

Walla W'la 5,300
Whatcom 534
Yakima 432
The Dis. Il's 524

WYOMING.—Area, 97,883 square miles.

Albany	2,021	Carbon	1,368	Laramie	2,957	Sweetwater	1,916
		Total					9,118

Unitah 856

Cities Having over Ten Thousand Inhabitants.

Census of 1870.

N. York, N. Y.	926,341	Detroit, Mich	79,580	Reading, Pa	33,932	Salem, Mass	24,117
Philad'a, Pa.	1st. 657,277	Milwaukee, Wis.	71,499	Columbus, O	33,745	Quincy, Ill	24,053
Philad'a, Pa.	2d. 674,022	Albany, N. Y	69,422	Paterson, N. J.	33,582	Manchester, N. H	23,536
Brookl'n, N. Y.	396,300	Providence, R. I.	68,906	Dayton, O	32,679	Harrisburg, Pa	23,109
St. Louis, Mo	310,864	Rochester, N. Y.	62,315	Kansas C'y, Mo.	32,260	Trenton, N. J	22,874
Chicago, Ill	298,983	Alleghenv, Pa	53,181	Mobile, Ala	32,184	Evansville, Ind	22,830
Baltimore, Md.	267,354	Richmond, Va	51,038	Portland, Me	31,414	N. Bedford, Mass	21,320
Boston, Mass	250,526	N. Haven, Ct.	50,840	Wilmington, Del.	30,841	Oswego, N. Y	20,910
Cincinnati, O	216,239	Charleston, S. C.	48,956	Lawrence, Mass.	28,921	Elizabeth, N. J	20,838
N. Orleans, La.	191,322	Troy, N. Y	45,481	Utica, N. Y	28,804	Lancaster, Pa	20,233
S. Franc'o, Cal.	149,482	Syracuse, N. Y	43,058	Toledo, O	28,546	Savannah, Ga	20,233
Buffalo, N. Y	117,715	Worcester, Mass.	41,105	Charlest'n, Mass.	28,323	P'ghkeepsie, N. Y	20,080
Washin'n, D. C.	109,204	Lowell, Mass	40,928	Lynn, Mass	28,233	Camden, N. J	20,045
Newark, N. J.	105,078	Memphis, Tenn	40,226	Fall River, Mass.	26,786	Davenport, Ia	20,032
Louisville, Ky	100,754	Cambrid'e, Mass.	39,634	Springfield, Mass.	26,703	St. Paul, Minn	20,031
Cleveland, O	92,846	Hartford, Ct	37,180	Nashville, Tenn.	25,872	Erie, Pa	19,646
Pittsburg, Pa	86,235	Indianapolis, Ind.	36,565	Peoria, Ill	25,287	Wheeling, W. V	19,282
Jersey C'y, N. J.	81,744	Scranton, Pa	35,093	Covington, Ky	24,505	Norfolk, Va	19,256

Taunton, Mass..18,629	Auburn, N. Y..17,225	Elmira, N. Y...15,863	Hudson, N. Y ..14,135
Chelsea, Mass ..18,547	Newburg, N.Y..17,014	Lockport, N. Y.15,458	Newbury't, Mass13,595
Dubuque, Ia ...18,404	Atlanta, Ga 16,986	Gloucester, Mass.15,387	Bingham'n, N.Y.12,862
Leavenw'th, Kan17,849	Norwich, Ct. ...16,653	Cohoes, N. Y. ...15,357	Concord, N. H. .12,241
Ft. Wayne, Ind. 17,718	Sacramento, Cal.16,484	N. Brunsw'k, Me.15,059	Schenec'y, N. Y.11,026
Springfield, Ill..17,365	Omaha, Neb....16,083	N. Albany, Ind .14,273	Ogdensb'g, N.Y.10,076

Census of the United States—1870. By States.

Alabama	996,961	Maryland ...	780,894	Pennsylvania.	3,515,993	Colorado	39,706
Arkansas....	483,179	Massachusetts	1,457,351	Rhode Island.	217,356	Dakota.....	14,181
California ...	560,285	Michigan	1,184,296	S. Carolina ..	728,000	Idaho	14,998
Connecticut..	537,418	Minnesota ...	435,511	Tennessee ...	1,257,983	Montana	20,594
Delaware....	125,015	Mississippi...	834,170	Texas.....	797,500	New-Mexico.	91,852
Florida.....	187,756	Missouri.....	1,715,000	Vermont	330,552	Utah	86,786
Georgia	1,200,609	Nebraska....	123,000	Virginia	1,224,830	Washington..	23,901
Illinois	2,539,638	Nevada	42,491	West-Virginia	445,616	Wyoming ...	9,118
Indiana	1,673,046	N. Hampshire	318,300	Wisconsin ...	1,055,167	Total Territories	442,500
Iowa	1,191,802	New-Jersey...	905,794	Tot'l States	38,092,741		
Kansas.....	362,872	New-York ...	4,364,411	TERRITORIES.		Total United States....38,535,241	
Kentucky ...	1,321,001	N. Carolina..	1,069,614				
Louisiana ...	732,731	Ohio	2,659,214	Dis. Columbia	131,705	..Total.....38,977,741	
Maine.....	626,463	Oregon.....	90,922	Arizona	9,658		

THE taking out of a patent in a foreign country does not prejudice a patent previously obtained here, nor does it prevent obtaining a patent here subsequently, unless the invention shall have been introduced into public use in the United States *for more than two years* prior to the application; and *provided*, that the patent shall expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term; but in no case shall it be in force more than seventeen years.

When application is made for a patent for an invention which has been already patented abroad, the inventor will be required to make oath that, according to the best of his knowledge and belief, the same has not been in public use in the United States for more than two years prior to the application in this country.

An applicant whose invention has been patented abroad, should state the fact that a foreign patent has actually been obtained, giving its date, and if there be more than one, of the one having the shortest term.

THE best engines and boilers develop a horse-power per hour by the consumption of two pounds of coal. But this is better than the average; and three pounds of coal per horse-power, per hour, is a more common result.

DRAWINGS FOR THE PATENT-OFFICE.

The rules of the Patent-Office in respect to drawings are stringent.

The following rules must be observed:

The paper must be thin Bristol board or thick drawing-paper, with a smooth or calendered surface. The outlines must be executed in deep black lines, to give distinctness to the print. Pale, ashy tints must be dispensed with.

In shading, lines of black ink should be used, and such lines should be distinct and sharp, and not crowded. Brush shadings or shadows will not be permitted.

All colors, except black, must be avoided in the drawing, lettering, and signatures; violet and purple inks must not be used.

No agent's, attorney's, or other stamp must be placed, in whole or in part, within the margin.

LIQUID GLUES.

Take of gum shellac three parts, caoutchouc (India rubber) one part, by weight. Dissolve the caoutchouc and shellac, in separate vessels, in ether free from alcohol, applying a gentle heat. When thoroughly dissolved, mix the two solutions, and keep in a bottle tightly stoppered. This glue is called marine glue, and resists the action of water both hot and cold, and most of the acids and alkalies. Pieces of wood, leather, or other substances, joined together by it, will part at any other point than the joint thus made. If the glue be thinned by the admixture of ether, and applied as a varnish to leather, along the seams where it is sewed together, it renders the joint or seam water-tight, and almost impossible to separate.

COPYING-INK

Take two gallons of rain-water, and put into it ½ pound of gum arabic, ½ pound brown sugar, ½ pound clean copperas, ¾ pound powdered nut-galls. Mix and shake occasionally for ten days, and strain. If needed sooner, let it steep in an iron kettle until the strength is obtained.

ABOUT CAVEATS.

THE filing of a caveat does not secure an exclusive right to make, use, and sell an invention. Such right is secured only by those who obtain patents. See page 8. The Patent-Office does not examine into the novelty of the invention when a caveat is filed. Such examination is only made when a patent is applied for.

INSPECTION OF THE BOTTOMS OF WELLS.

SUFFICIENT light to enable any one to see the water or earth at the bottom of a well can be directed down the shaft by means of an ordinary looking-glass. If the well be under cover, two glasses will be required, and the ingenious reader will, by a little experimenting, soon be able to arrange them in the right positions.

SCREW-THREADS FOR GAS-PIPES.

THE standard for gas-pipes is as follows:

Diameter inside.	Threads to the inch.	Diameter inside.	Threads to the inch.
⅛	27	1	11½
¼	18	1¼	11½
⅜	18	1½	11½
½	14	2	11½
¾	14		

For all diameters above this, eight threads per inch is the standard.

IT is immeasurably difficult to refute false doctrines, because they rest on convictions that error is truth.—*Liebig.*

AN undergraduate at Cambridge, who found among the questions on his examination paper this: "Why will not a pin stand upon his point?" elaborately explained the point thus: 1. A pin will not stand on its head, much less is it possible that it should stand on its point. 2. A point, according to Euclid, is that which has no parts and no magnitude. A pin can not stand on that which has no parts and no magnitude, and therefore a pin can not stand on its point. 3. It will if you stick it in.

MUST I sign the patent papers in the country where my residence is, or can I sign them wherever I happen to be when I desire to apply for the patent?

Answer. You can sign them wherever you happen to be. The affidavit may be made before a Justice of the Peace, Commissioner of Deeds, Notary Public, or any person authorized to administer oaths. When the applicant is in a foreign country, the oath must be made before a Notary Public, or before a United States Consul or Minister.

A PATENTEE can not recover damages for any use of his invention prior to the issue of his *patent.* All persons have a right freely to make, use, and sell any article, process, or invention prior to the grant of the patent. Therefore, the sooner the patent is applied for the better.

EARN WHAT YOU SPEND.

THREE fourths of the difficulties and miseries of men come from the fact that most want wealth without earning it, fame without deserving it, popularity without temperance, respect without virtue, and happiness without holiness. The man who wants the best things, and is willing to pay just what they are worth, by honest effort and hard self-denial, will have no difficulty in getting what he wants at last. It is the men who want goods on credit that are snubbed and disappointed, and overwhelmed in the end. Happiness can not be bought by the bottle, nor caught up by the excursion-train, nor put on with any robe or jewels, nor eaten at any feast. It does not exist in any exhilaration, excitement, or ownership, but comes from the use of the faculties of body and mind.

UNDERDRAINING.—Surface water that flows off the land instead of passing through the soil, carries with it whatever fertilizing matter it may contain, and abstracts some from the earth. If it pass down through the soil to drain, this waste is arrested.

NEW-YORK AND WASHINGTON.

THERE are perhaps no two cities in this country to which inventors and patentees are more frequently called, in the course of business, than New-York and Washington. For the convenience of our inventive friends, we subjoin a list of the principal objects and places of interest, which they should endeavor to see whenever they visit either place. Inventors will always be welcome at our offices in New-York or Washington; and we hope they will "walk in" without knocking. We shall be happy to give them any information. (See page 13.)

WASHINGTON.—PLACES OF INTEREST.

Arsenal.
Alexandria, Va.
Aqueduct.
Battle-Fields of Bull Run.
Congressional Cemetery.
Capitol and Grounds.
Georgetown Heights.
General Post-Office.
Government Insane Asylum.
Government Green-Houses.
Jackson's Statue.
Long Bridge.
Mount Vernon.
National Observatory
Navy Yard.
Navy Department.
Potomac Falls.
Presidential Mansion and Gardens.
Patent Office.
Scientific American Office.
Smithsonian Institute.
Soldier's Home.
Treasury Department.
War Department.
Washington Monument.
Washington's Statues.

NEW-YORK.—PLACES OF INTEREST.

Academy of Music.
Academy of Design.
Asylum for the Blind.
Astor Library.
Atlantic Docks.
Battery.
Bible House.
Blackwell's Island.
Central Park.
City Hall.
Cooper Institute.
Croton Reservoir.
Dry Dock.
Fort Hamilton.
Fort Lafayette.
Governor's Island.
Greenwood Cemetery.
High Bridge.
Hoboken.
Navy Yard.
Post-Office.
Scientific American Office.
Sub-Treasury.
South Street.
Staten Island.
Tombs.
Trinity Church.
United States Custom House.
Washington Monument.
Worth Monument.
Wall Street.
Washington Market.

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